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Environmental Impact Report
Volume 2

San Francisco Public Utilities Commission
**CALAVERAS DAM
REPLACEMENT PROJECT**



San Francisco Planning Department File No. 2005.0161E
State Clearinghouse No. 2005102102

Public Draft EIR Publication Date: October 6, 2009

Draft EIR Public Hearing Date:

November 10, 2009 in East Bay

November 12, 2009 in San Francisco

Draft EIR Public Comment Period: October 6, 2009 through November 20, 2009

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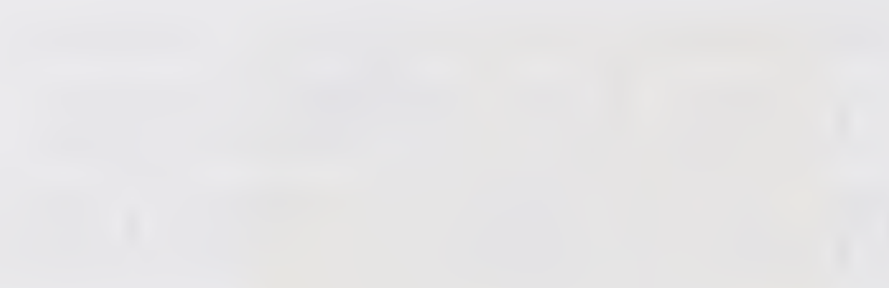
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This section describes the potential impacts of the proposed project on water quality at and in the vicinity of the project site. Subsection 4.7.1, Setting, presents existing water quality information for Calaveras Reservoir and the creeks found in the study area. The study area includes streams that could be affected by operation of the proposed dam, whereas the project area is based on the project footprint. Subsection 4.7.1.2, Regulatory Framework, describes the pertinent federal, state, and local regulations and policies related to water quality. Subsection 4.7.2, Impacts, defines the significance criteria and presents a discussion of impacts.

4.7.1 SETTING

The primary study area encompasses the watersheds of upper Alameda Creek, Arroyo Hondo, and Calaveras Creek. As noted in Section 4.3, Land Use, Agricultural Resources, and Recreation, the primary study area is entirely rural lands with a predominantly natural landscape. This natural environment largely determines water quality in the area and, as such, the contaminants that are present have natural background sources such as sediment. Contaminants associated with urban sources are largely absent. Cattle grazing is widespread in the watershed and is the primary source of non-natural contaminants.

The extended study area includes Alameda Creek from its confluence with Arroyo de la Laguna and downstream to San Francisco Bay. In contrast to the primary study area, streams in the extended study area that contribute to Alameda Creek are substantially affected by contaminants derived from urban sources. The northerly portion of the Alameda Creek watershed includes the Arroyo Mocho and Arroyo de la Laguna watersheds that drain the Tri-Valley area, which has substantial urban development (Livermore, Pleasanton, and Dublin) as well as adjacent higher lying areas of rural watershed, vineyard, and grazing lands. The urbanization within that part of the watershed contributes more diverse contaminants to the flows that enter Arroyo de la Laguna compared to those originating from the primary study area. Arroyo de la Laguna carries these contaminants into Alameda Creek, through Niles Canyon, and then into the lower reaches of Alameda Creek, which flows through a largely urbanized area.

The Regional Water Quality Control Board (RWQCB) is required to develop, adopt, and implement a water quality control plan for the region that describes the legal, technical, and programmatic basis of water quality regulation, including the designation of beneficial uses of

surface waters and groundwater (RWQCB 2006). Table 4.7.1 presents a summary of the beneficial uses for Alameda Creek, Arroyo Hondo, and Calaveras Reservoir. The beneficial uses of the water bodies generally apply to all tributaries. The *Water Quality Control Plan for the Bay Area Bay Basin* (Basin Plan) (RWQCB 2006) also establishes water quality objectives to protect water quality, as described in more detail in Subsection 4.7.1.2, Regulatory Framework. The Basin Plan water quality objectives provide a basis for establishing appropriate levels of water quality to protect beneficial uses.

Table 4.7.1: Beneficial Uses Identified in the Basin Plan

Water Body ¹ / Groundwater Basin	Designated Beneficial Uses ²
Surface Water²	
Alameda Creek	AGR, COLD, GWR, MIGR, REC-1, REC-2, SPWN, WARM, WILD
Arroyo Hondo	COLD, FRSH, MUN, REC-1, REC-2, SPWN, WARM, WILD
Calaveras Reservoir	COLD, MUN, REC-1 (limited beneficial use ³), REC-2, SPWN, WARM, WILD
Groundwater²	
Alameda Creek (Niles Cone) Groundwater Subbasin	MUN, PROC, IND, AGR
Santa Clara Valley (and Coyote) Groundwater Subbasin	MUN, PROC, IND, AGR
Notes: ¹ Calaveras Creek is not identified in the Basin Plan. ² Key: Surface Water: AGR (Agricultural Supply); COLD (Cold Freshwater Habitat); FRSH (Freshwater Replenishment); GWR (Groundwater Recharge); MIGR (Fish Migration); MUN (Municipal and Domestic Supply); REC-1 (Water Contact Recreation); REC-2 (Noncontact Water Recreation); SPWN (Fish Spawning); WARM (Warm Freshwater Habitat); WILD (Wildlife Habitat). Groundwater: AGR (Agricultural Water Supply); IND (Industrial Service Water Supply); MUN (Municipal and Domestic Water Supply); PROC (Industrial Process Water Supply). Beneficial uses for specific wetland sites affected by the project will be determined as needed based on the process described in Chapter 4 of the Basin Plan. ³ Fishing, boating, and body contact recreation are not currently allowed at Calaveras Reservoir.	

Source: RWQCB 2006

4.7.1.1 EXISTING CONDITIONS

Subsection 4.7.1.1 Contents

Calaveras Reservoir

Temperature

Dissolved Oxygen

Dissolved Oxygen Concentrations

Hypolimnetic Oxygenation System

pH

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Asbestos and Metals Associated with the Franciscan Complex

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Alameda Creek

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Calaveras Reservoir

Calaveras Reservoir impounds and stores water from the local sub-watersheds (see Section 4.6, Hydrology). The watersheds of Arroyo Hondo, Calaveras Creek, and upper Alameda Creek are located entirely within rural natural areas with few residences or other development. The reservoir is surrounded by San Francisco Public Utilities Commission (SFPUC) land with restricted public access. SFPUC management of the watershed lands surrounding the reservoir is directed toward preserving water quality of the reservoir. Additionally, there are no notable operations (e.g., sluicing) of the water system upstream of Calaveras Reservoir that affect its quality. Winter and spring flows of the contributory streams are unregulated and transport sediment into the reservoir, which settles to the bottom. Thus, overall, water in Calaveras Reservoir is of excellent quality.

Reservoir inflow mostly occurs in the mid-October to mid-April rainy period and is dominated by winter rainfall. Because the reservoir stores local runoff only, water quality is fairly consistent, except for seasonal turbidity (SFPUC 2001b, p. 2-5). Water quality conditions are typical of a relatively deep temperate lake, with stratification occurring during the summer months (SFPUC 2003, p. 4). Reservoir stratification during the warm months leads to changes in water quality depending on the time of year and depth within the reservoir. When the reservoir stratifies, warm water overlies the deeper colder water, which creates a stable condition that inhibits mixing. Thus, anoxic (or low dissolved oxygen) conditions develop in the lower portion of the reservoir, which can serve to liberate nutrients from reservoir sediments and increase hydrogen sulfide

concentrations (SFPUC 2003, pp. 4, 15). Calaveras Reservoir exhibits characteristics typical of mesotrophic waters, with moderate nutrient levels and microbiological activity.

The SFPUC restricts public access to the reservoir and to the watershed to protect water quality. Recreational uses in the reservoir and watershed, such as boating, fishing, and swimming, are not allowed. The primary contamination sources include cattle, wildlife, and soil erosion. To further protect water quality, in October 2006 the SFPUC began to install riparian fencing that will limit livestock activity in the watershed. Installation of the fencing is expected to be completed in 2009.

In 1997, the SFPUC entered into a Memorandum of Understanding (MOU) with the California Department of Fish and Game (CDFG) to establish a minimum release schedule from Calaveras Reservoir and related flow requirements for the purpose of sustaining suitable fish habitat in Calaveras and Alameda Creeks downstream of the dam. The MOU requires the SFPUC to conduct a monitoring program to evaluate several years of pre-water-release conditions and the first 5 years of post-water-release conditions. The monitoring program is designed to determine if temperature, dissolved oxygen, pH, turbidity, ammonia, and hydrogen sulfide concentrations are within the range to maintain healthy native fish populations (see Section 4.5, Fisheries and Aquatic Habitat, for additional detail).

Temperature

Reservoir water temperature is considered a key water quality parameter with respect to aquatic life. Calaveras Reservoir water temperatures are typically isothermal from December through February, which indicates complete mixing of the reservoir and a relatively constant temperature in the water column. From March through November, the reservoir typically stratifies, with the most intense period generally between June and October. Calaveras Reservoir water temperature trends, as well as the effects of temperature on aquatic species, are further described in Section 4.5, Fisheries and Aquatic Habitat.

Even under California Division of Safety of Dams (DSOD)-restricted storage conditions, Calaveras Reservoir remains sufficiently deep (approximately 80–90 feet) to experience persistent seasonal thermal stratification. Under these restricted conditions, the lower level of the water (the hypolimnion) occupies the bottom 40 feet or so of the reservoir profile. The historical, (pre-DSOD-restriction) depth to the thermocline¹ was similar, but the reservoir maintained a notably deeper hypolimnion of up to 100 feet (SFPUC 2002a, p. 4-2).

¹ The thermocline is the boundary between the warmer surface waters and cooler waters below.

Dissolved Oxygen

Dissolved Oxygen Concentrations

Adequate dissolved oxygen (DO) concentrations are required for aquatic species survival as well as for limiting drinking water odor and taste problems. According to the RWQCB Basin Plan, reservoir DO concentrations for cold-water habitat should be greater than 7.0 milligrams per liter (mg/L) and should be greater than 5.0 mg/L for warm-water habitat (RWQCB 2006, Section 3.3). When Calaveras Reservoir is isothermal, DO concentrations are near saturation. From 2000 to 2002, DO concentrations were above 7 mg/L throughout the water column until stratification occurred (SFPUC 2002a, 2002b, 2004). From 2003 to 2004, DO concentrations were above 5 mg/L throughout the water column while the reservoir was isothermal (SFPUC 2005, 2006a). When the reservoir stratified by the end of March, DO concentrations in the hypolimnion dropped to less than 1 mg/L while remaining near saturation in the top-most layer of the water (the epilimnion). From about July to October, most of the water below the thermocline has been anoxic, with DO concentrations approaching zero near the bottom. Under DSOD restrictions, anoxic conditions are likely to recur annually due to the reduced volume of oxygenated water available at the onset of stratification (SFPUC 2006a, p. 4-4). As the fall turnover (mixing of upper and deeper water) in the reservoir progresses through about December and new inflow occurs, well-oxygenated waters are able to mix with deeper waters, replenishing the oxygen throughout the water column. At the same time, isothermal conditions occur, which promote mixing of oxygen in the reservoir.

Algal monitoring is typically performed at Calaveras Reservoir twice monthly, and the results are reported to the SFPUC Water Supply and Treatment and Water Quality Divisions and summarized in Watershed Sanitary Surveys. The growth of blue-green algae has been historically managed with low doses of copper sulfate, including in the first 3 years of the baseline (2003-2005), which has been the only herbicide used in the reservoir. The SFPUC halted applications at the end of 2005 and is not currently using this algicide in Calaveras Reservoir; however, it may be used in the future if the State Water Resources Control Board (SWRCB) permits its use and if alternative herbicides such as sodium percarbonate fail to produce results. All herbicides used in the reservoir will require a permit, unless one is already in place. Table 4.7.2 lists the record of copper sulfate treatments occurring from 1987 until 2005.

Table 4.7.2: History of Calaveras Reservoir Copper Sulfate Treatments

Date of Application	Copper Sulfate Treatments (pounds)
7/15/87	6,000
8/11/88	9,600
10/12/88	16,350
5/13/89	18,600
2/21/90	12,650
5/14/90	11,900
9/19/90	7,700
11/07/90	4,950
5/12/93	16,100
9/16/94	11,900
5/17/95	16,150
10/19/95	7,700
4/29/96	8,150
5/17/98	9,750
6/22/99	9,750
11/10/03	2,100
7/15/04	1,900
9/29/05	2,800

Source: SFPUC 2005

Hypolimnetic Oxygenation System

Low DO levels found in the deeper water within Calaveras Reservoir in the summer and early fall can cause internal nutrient loading due to the sediments in the reservoir that affect algal growth, and can also allow metals (e.g., iron and manganese) to be leached from the sediments, thereby affecting the ability of the Sunol Valley Water Treatment Plant (SVWTP) to treat the water. At the current DSOD-restricted pool elevation of 705 feet, conditions favor the growth of undesirable algae. During the late summer and fall when Calaveras Reservoir stratifies, hypolimnetic aeration is carried out to enhance water quality by reducing the concentrations of dissolved iron, manganese, and hydrogen sulfide in the raw water (SFPUC 2001b, p. 2-5).

The SFPUC began operation of its hypolimnetic oxygenation system (HOS) in September 2005. The HOS can deliver a daily maximum of 6,290 pounds of oxygen during peak periods in the summer and fall (SFPUC 2006b, p. 5-17). After the oxygenation system was put into operation, DO concentrations increased (SFPUC 2007). The SFPUC expects to operate the system annually to prevent anoxic conditions from forming in spring, thereby increasing suitable habitat for resident rainbow trout within the reservoir and improving the quality of water available for

release to Calaveras Creek. The location and operation of this system are further discussed in Chapter 3, Project Description.

pH

pH is a measure of hydrogen ion concentration, which indicates acidity or alkalinity, with 7.0 representing neutral conditions. According to the RWQCB Basin Plan, reservoir pH should be between 6.5 and 8.5 (RWQCB 2006, Section 3.3). Since DSOD-restricted reservoir levels were implemented, pH values have ranged from a low of 6.6 in early June 2003 to a high of 8.7 in late May 2004. Prior to the DSOD restriction, a low pH of 6.4 was measured in August 2000 and highs of 8.6 to 8.7 were measured between May and mid-August of that same year. Prior to 2000, information on pH monitoring was not available for Calaveras Reservoir in the Alameda Creek Aquatic Resources Monitoring Reports.

Turbidity

Turbidity is the amount of particulate matter suspended in water. High turbidity can lead to increased water temperatures and decreased DO concentrations, which can be detrimental to water quality and aquatic species. According to the RWQCB Basin Plan, increases from normal background turbidity related to waste discharge cannot be greater than 10 percent in areas where natural turbidity is greater than 50 nephelometric turbidity units (NTU) (RWQCB 2006, Section 3.3). Since DSOD-restricted reservoir levels were implemented in 2001, the highest measured turbidities in Calaveras Reservoir have generally ranged from about 28 to 41 NTU and are likely the result of the interaction between the reservoir's reduced water levels and storm runoff (SFPUC 2006a, p. ii). Some of the highest turbidities ever measured in the reservoir occurred in 2002 (500 NTU) as a result of the reservoir being at its lowest level in over 10 years, in combination with a series of storms in November and December of that year. The combination of low water level and stormwater runoff presumably washed significant amounts of sediment from the exposed alluvium at the tributary confluences with the reservoir as well as from exposed sediments that had been previously deposited on the reservoir bottom (SFPUC 2004, p. 4-6). High turbidities (260 NTU maximum) were also measured in early January 2005 due to large storms that contributed to high sediment-laden flows in Arroyo Hondo, the major tributary to the reservoir (SFPUC 2007). After January 2005, turbidities decreased and generally stayed below 5 NTU for the remainder of that year. An Alameda Creek Aquatic Resources Monitoring Report has not been released since the results for 2005 were reported (SFPUC 2007), so data on turbidity in the reservoir since 2005 are not available.

High turbidities in the reservoir generally occur from December to January, reflecting inflow containing suspended sediment and the related currents induced by inflow in the reservoir. After the rainy season ends, turbidity generally follows a typical settling pattern, with the uppermost waters clearing more rapidly than bottom waters as suspended particles settle out. Turbidity then

slightly increases as the reservoir turns over again in autumn (SFPUC 2007, p. 4-9). Average turbidity in Calaveras Reservoir has generally remained below 2.4 to 5.0 NTU throughout most of the year since the DSOD restrictions have been in place. Turbidities presented in the Watershed Sanitary Survey Update (2006), which generally represent the time during which DSOD-restricted levels have been in effect, were lower than those reported in the 2000 Watershed Sanitary Survey (SFPUC 2006b, p. 5-22).

Ammonia

Ammonia is produced during the aerobic decomposition of organic matter by bacteria and is also a waste product of aquatic organisms as part of metabolism. High concentrations of ammonia, however, can be toxic to aquatic life. The RWQCB Basin Plan established the maximum threshold for ammonia in surface water at 0.4 mg/L (RWQCB 2006, Section 3.3.20). Reservoir ammonia levels have exceeded this standard on several occasions throughout the year; however, most measurements were within acceptable levels. In 2001, ammonia levels in the reservoir did not exceed 0.14 mg/L. Ammonia concentrations exceeded 1 mg/L on one occasion between 2002 and 2004, measuring 1.3 mg/L on November 18, 2002. Beginning in 2002, ammonia levels were fairly consistent with previous, pre-DSOD-restricted years from January to June; however, beginning in July, ammonia decreased in the epilimnion as a result of uptake by algal cells. In August, ammonia concentrations started to increase near the bottom of the reservoir and continued to build into November. By December, the levels decreased as fresh inflows provided some dilution. It appears that a contributing factor to the higher ammonia levels is the wastes from the same biota mass (e.g., fish) being concentrated in a smaller volume of water after the reservoir level was reduced under DSOD restrictions (SFPUC 2004, p. 4-7). Reservoir ammonia levels were not monitored as part of the Alameda Creek Aquatic Resources Monitoring Reports prior to 2001.

Asbestos and Metals Associated with the Franciscan Complex

Part of the dam site and reservoir are in contact with the Franciscan Complex, a geologic formation that contains naturally occurring asbestos (NOA) and heavy metals. NOA and metals have been found in rock exposures, in alluvium derived in part from sediments originally of Franciscan Complex origin (including Calaveras Creek downstream of the dam), and in colluvium (slope soil wash materials) derived from Franciscan Complex rock (URS 2009, p.4-1). (Also see Section 4.8, Geology, Soils, and Seismicity, and Section 4.9, Hazards and Hazardous Materials, for a discussion of geologic formations, NOA, and metals.)

Much of the Franciscan Complex is a weak, sheared, and weathered material of varied composition known as *mélange*. Rock types in the *mélange* of particular concern in regard to NOA and metals are exposures of serpentinite, blueschist, and greenstone. Additionally, portions of the existing dam materials and some existing topsoil and fill material at Disposal Sites 3 and 7

are comprised of materials taken from the local Franciscan mélange at the site. Both chrysotile and amphibole asbestos are found in the area. Franciscan Complex rock can contain naturally elevated concentrations of asbestos, arsenic, chromium, copper, and nickel (Wilke 2000). If the rock materials and soil are disturbed, these contaminants could be detrimental to water quality.

Prior to distribution, water from the Calaveras Reservoir is treated at the SVWTP. Treatment processes include coagulation, flocculation, sedimentation, filtration, and disinfection. These processes remove or substantially reduce concentrations in drinking water.

Exposure of raw water in the reservoir and streams to the geologic materials noted above has the potential to weather out or wash out asbestos and metals. Historical water quality monitoring results for Calaveras Reservoir indicate that asbestos concentrations have varied from minimal to relatively high levels. As naturally occurring earth materials are subject to weathering and erosion, some background levels of asbestos and metals are present at all times in the reservoir and streams that flow across Franciscan mélange and alluvium derived from it. This phenomenon is characteristic of the watershed as a whole, as Franciscan Complex rocks are widespread in occurrence. Most of the weathered and eroded material settles out in sediments in the reservoir bottom and in creek beds. Some is temporarily contained in the water column. The highest measured value of asbestos in the reservoir was 61.7 micro-fibers per liter in 1979. The cause of this recorded elevated asbestos level is not known but may have been related to the rock buttress material that was placed on the upstream face of the dam during construction in 1974 and early 1975. Based on periodic sampling after 1979, asbestos concentrations diminished to undetectable.

SFPUC Watershed Sanitary Survey Update Results

In April 2006, the SFPUC provided the most recent water quality findings from its Watershed Sanitary Survey Update. Major monitoring programs for Calaveras Reservoir include microbiology, annual monitoring of numerous constituents regulated under the Safe Drinking Water Act, and reservoir limnology and conventional water quality.

The SFPUC Watershed Sanitary Survey Update (2006b) indicated that the range of total coliform concentrations in Calaveras Reservoir has been wide and can at times be high. *E. coli* density, which is a better indicator of fecal pollution than total coliforms, was found to be considerably lower than total coliforms. As no urban areas drain into the reservoir and recreational uses are prohibited, the primary sources of coliform are livestock and wildlife of the general area. Sampling in Calaveras Reservoir was performed for both total coliforms and *E. coli* through 2001. Parasite numbers were found to be low, with only 5 percent of samples testing positive for *Giardia* and 7 percent of samples testing positive for *Cryptosporidium*. These numbers are similar to those presented in the 2000 Watershed Sanitary Survey.

Soils and Sensitivity to Erosion

Soils are described in Subsection 4.8.1.3, Soils, in Section 4.8, Geology, Soils, and Seismicity. Soils in the vicinity of the proposed replacement dam are located on the steep valley slopes bordering Calaveras Creek. The soils are derived from the underlying geologic materials that include Franciscan Complex *mélange* to the east of the creek and Temblor Sandstone on the western slopes. The Franciscan *mélange* has experienced landsliding at the surface, including the large right-abutment landslide, which has variable character and low strength. Such soils are subject to high erosion hazard. Soil types at the construction sites (dam area, borrow sites, fill areas) include the Los Gatos–Los Osos complex, Perkins loam, Gaviota loam, Vallecitos rocky loam, Yolo loam, and rock land. The erosion potential of soils is rated as “severe” in the dam site vicinity, including the slopes and valley bottom areas. Most of the area in Calaveras Valley and adjacent ridges is rated as having “high” sensitivity to erosion (SFPUC 2001b, Figure 2-2). The slopes above the area on the south side of the reservoir contain Gaviota gravelly loams and Gaviota–Los Gatos complex soils (SFPUC 1994, p. 8), and Yolo loams have developed on the alluvial terraces immediately south of the reservoir; these soil types are subject to “moderate” erosion hazard. Borrow Area E has sandy loam to silty loam clay soils, which are subject to “moderate” erosion. The west side of the reservoir contains Los Osos clay loams and Gaviota gravelly loams, which have a “moderate” sensitivity to erosion (SFPUC 1994, p. 8; SFPUC 2001b, Figure 2-2). Disposal Sites 3 and 7 have “moderate to high” sensitivity to erosion (SFPUC 2001b, Figure 2-2).

Alameda Creek

Like Calaveras Reservoir, the portion of the Alameda Creek watershed located in the primary study area is entirely rural natural land with few human developments. Most of the land is located within the Sunol Wilderness Regional Preserve and SFPUC lands managed for watershed. As a result, water in Alameda Creek is generally of excellent quality. In the extended study area, downstream of the confluence of Alameda Creek and the Arroyo de la Laguna, water quality is also influenced by runoff from the urban and agricultural landscapes of the Tri-Valley area, and urban type uses in Sunol and residences in Niles Canyon. Lower Alameda Creek is located within the urban area of Fremont but is largely isolated from contaminants by levees. The following discussion focuses on water quality conditions in the portions of the watershed related most directly to operation of the existing reservoir, that is, the area upstream of the confluence of Alameda Creek and the Arroyo de la Laguna.

Aquatic resources in Alameda Creek have been monitored since 1998 as part of the 1997 MOU with CDFG. Water temperature, turbidity, pH, and DO concentrations have been measured annually in each of the electro-fishing habitat units. The naming convention for monitoring locations, as well as the number of monitoring stations, has varied from 1998 to 2004. Reach 1 from the *1998 Alameda Creek Aquatic Resources Monitoring Report* includes the lower 1,530

feet of Alameda Creek upstream of the confluence with Calaveras Creek (includes part of the segment designated in this EIR as Reach A-3 – see Figure 4.5.1, Fisheries and Aquatic Habitat Study Areas, in Section 4.5, Fisheries and Aquatic Habitat). This area of Alameda Creek approximately 2 miles downstream of the Alameda Creek Diversion Dam (ACDD) and upstream of the confluence with Calaveras Creek had a turbidity measurement of 1.0 NTU, DO concentration of 9.8 mg/L, and a pH of 8.14 (SFPUC 1999). The temperature measurements taken between July 16 and October 26, 1998 ranged from a high of 75.7 degrees Fahrenheit (°F) in mid-July and early August to a low of 53.6°F in October, with daily temperature fluctuations ranging from 36°F to 43°F (SFPUC 1999, p. 4-1). In 2004, the average DO concentration for the three monitoring stations in Alameda Creek downstream of the ACDD was 7.9 mg/L, the average pH was 7.7, the average temperature was 60.3°F, and the average turbidity was 0.83 NTU (SFPUC 2006a, p. 5-19). Water quality monitoring data, although based only on single samples during the fall of each year, indicate that both pH and DO have remained within the acceptable limits established in the RWQCB Basin Plan both prior to and since DSOD-restricted reservoir levels have been in place (RWQCB 2006, Section 3.3).

Turbidity in Alameda Creek downstream of the ACDD showed a small decrease in 2004 as compared to 1998. Sluicing is, in general, conducted on an annual basis at the ACDD, normally in February. Sluice gates in the dam are opened for 48 hours to flush sediment from the upstream side of the dam. The gates are opened to produce a velocity of about 50 cubic feet per second (cfs), and a total of about 900 cubic yards of material is washed downstream of the ACDD. Sluicing procedures are intended to remove accumulations of coarse sediment to protect the facility, maintain storage capacity (and thus diversion capacity) upstream of the diversion dam, and support downstream geomorphic processes by passing the sediment. Because of its short duration and timing to coincide with winter high flows, sluicing produces only brief increases in turbidity of the creek. At other times, turbidity is the result of natural flow and sediment transport conditions in the creek.

In the reach of Alameda Creek downstream of the confluence with Calaveras Creek, water quality monitoring was also performed as part of the 1997 MOU monitoring program. Reach 3 from the 1998 monitoring report extends from the confluence of Alameda and Calaveras Creeks downstream to the fence between the Sunol Wilderness and SFPUC lands (equivalent to parts of Reach A-2 and A-3 in this EIR – see Figure 4.5.1, Fisheries and Aquatic Habitat Study Areas). This area of Alameda Creek downstream of the confluence had a turbidity measurement of 1.0 NTU, DO concentration of 9.45 mg/L, and a pH of 7.94 (SFPUC 1999). The temperature measurements taken between July 16 and October 26, 1998 ranged from a high of 84.7°F during early September to a low of about 50.9°F in October, with daily temperature fluctuations ranging from 43°F to 50°F (SFPUC 1999, p. 4-1). In 2004, the average DO concentration for the three monitoring stations in the same stretch of Alameda Creek downstream of the confluence with Calaveras Creek was 5.5 mg/L, the average pH was 7.3, the average temperature was 58.5°F, and

the average turbidity was 0.89 NTU (SFPUC 2006a, p. 5-19). Average DO concentrations in 2004 did not meet the Basin Plan cold-water habitat minimum standard of 7.0 mg/L.

In general, limited temperature and total dissolved solids (TDS) data are available for Alameda Creek downstream of the ACDD in addition to what has been collected as part of the recent *Alameda Creek Aquatic Resource Monitoring Reports*. Water quality data in Alameda Creek near Sunol (equivalent to Reach A-1 in this EIR – see Figure 4.5.1, Fisheries and Aquatic Habitat Study Areas) are discussed below to extrapolate conditions that could occur in Alameda Creek downstream of the ACDD. Although the source of water quality data in Alameda Creek near Sunol was taken at a site approximately 8 miles north of Calaveras Dam, there is little development downstream of the project area, which suggests that the water quality in the project area is equal to or better than that at the reference site, which is located adjacent to substantial quarrying, nursery, residential, and industrial uses.

Water quality in Alameda Creek in Reach A-1 is generally good and is protective of beneficial uses (see Table 4.7.1, presented earlier in this section). For aquatic life, the key water quality parameter is temperature, which is directly related to hydrologic flow conditions. Table 4.7.3 summarizes weekly water temperature data collected in Alameda Creek by the Alameda County Water District (ACWD) near Sunol upstream of the confluence with the Arroyo de la Laguna (Reach A-1) from 1997 through 2005. Average monthly water temperatures show an expected seasonal trend (i.e., cooler during the winter and warmer during the summer).

Table 4.7.3: Summary of Temperature Data, Alameda Creek Near Sunol, 1997–2005 (degrees Fahrenheit)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	50	55.4	59	64.4	69.8	73.4	–	–	–	–	–	50
1998	51.8	51.8	57.2	60.8	60.8	64.4	73.4	78.8	71.6	59	55.4	51.8
1999	44.6	51.8	55.4	60.8	62.6	73.4	–	–	–	–	–	–
2000	55.4	55.4	59	60.8	71.6	77	71.6	69.8	–	64.4	55.4	51.8
2001	50	51.8	62.6	64.4	71.6	–	–	–	–	–	59	53.6
2002	53.6	53.6	55.4	62.6	64.4	69.8	66.2	71.6	69.8	69.8	59	50
2003	–	–	–	–	–	–	–	71.6	–	–	–	53.6
2004	55.4	53.6	59	60.8	64.4	68	66.2	–	–	–	–	–
2005	48.2	55.4	53.6	55.4	64.4	71.6	73.4	75.2	69.8	66.2	57.2	51.8
Average	51.1	53.6	57.7	61.3	66.2	71.1	70.2	73.4	70.4	64.9	57.2	51.8

Sources: ACWD (raw data provided by Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD temperature data may not have been subject to the rigorous quality assurance/quality control procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Table 4.7.4 provides a summary of TDS data for the same location and period as for temperature, shown in Table 4.7.3. Unlike temperature, TDS does not exhibit a seasonal trend. TDS is an indicator of the overall inorganic materials in the water.

Table 4.7.4: Summary of Total Dissolved Solids Data, Alameda Creek Near Sunol, 1997–2005 (milligrams per liter)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	–	–	190	266	280	268	–	–	–	–	–	306
1998	233	148	180	195	235	260	279	284	283	309	233	381
1999	313	228	259	276	309	298	–	–	–	–	–	–
2000	361	286	209	305	304	315	319	320	–	331	359	367
2001	486	389	361	367	355	–	–	–	–	–	338	277
2002	186	258	273	278	278	278	291	260	323	334	368	332
2003	–	–	–	–	–	–	–	365	–	–	–	407
2004	313	299	366	307	322	343	348	–	–	–	–	–
2005	246	297	205	192	247	256	290	281	304	302	337	314
Average	305	272	255	273	291	288	305	302	303	319	327	341

Sources: ACWD (raw data provided by Laura Hidas); Merritt Smith Consulting (data reduction). Note that ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions (unless otherwise specified by the ACWD).

Calaveras Creek

The primary sources of Calaveras Creek flow downstream of the dam (Reach C-1) are direct inflow, seepage flow below the dam, and water from Calaveras Reservoir releases. There are no appreciable tributaries to the creek between Calaveras Dam and the Alameda Creek confluence. Water quality conditions in Calaveras Creek therefore depend to large extent on water quality conditions in the reservoir. Water sources in Calaveras Creek related to operation of the reservoir include discharges through the cone valve conducted as test releases or, as in the spring of 2006,

releases to rapidly draw down the reservoir. Historically, there also were spills of the reservoir, but none has occurred during the baseline period (see Section 4.6, Hydrology). The SFPUC also has installed smaller release valves for release of low environmental flows into Calaveras Creek.

Three intake pipes (called adits) are located in Calaveras Reservoir to increase operational flexibility of reservoir outflow to Calaveras Creek. The adits are used to withdraw water from the reservoir for releases to Calaveras Creek via the cone valve or for delivery to the SVWTP via the Calaveras Pipeline. Under normal operating conditions (pre-DSOD restriction), water withdrawals for delivery to the SVWTP typically occurred through one or both of the upper adits for water quality reasons and fish conservation. The upper portion of the reservoir historically had higher oxygen content, lower suspended solids, and fewer taste and odor concerns. DO can be depleted at the bottom of the reservoir, and DO depletion is associated with high metals, color,

and odor levels; thus, by drawing water from the port closest to the 20- to 40-foot depths, the water is low enough in phytoplankton concentrations to avoid filtration problems, yet high enough in DO to minimize the metals in solution (SFPUC 2006b, p. 5-16). The HOS that was installed in 2005 has greatly reduced these historical water quality concerns in the lower portion of the reservoir.

In the reach of Calaveras Creek downstream of Calaveras Dam, water quality monitoring has been performed as part of aquatic resource surveying since 1998. Reach 2 from the 1998 Alameda Creek Aquatic Resources Monitoring Report (Reach C-1 as presented in this EIR) extends from the confluence of Alameda and Calaveras Creeks upstream 1,100 feet towards the dam (see Figure 4.5.1, Fisheries and Aquatic Habitat Study Areas, in Section 4.5, Fisheries and Aquatic Habitat, which shows the Alameda–Calaveras Creek confluence area). This area of Calaveras Creek had a turbidity measurement of 0 NTU, DO concentration of 7.9 mg/L, and a pH of 7.85 (SFPUC 1999, Table 4.3). In 2004, the average DO concentration for the monitoring stations on Calaveras Creek (Monitoring Stations 8-1 and 8-2) was 3.9 mg/L, the average pH was 7.07, and the average turbidity was 0.92 NTU (SFPUC 2006a, p. 5-19). Table 4.7.5 provides a summary of water quality monitoring samples that were collected during the fall or winter of each year. DO concentrations in most years did not meet the Basin Plan cold-water habitat minimum standard of 7.0 mg/L.

Measurements of turbidity are not available during times of cone valve testing and operation. Because of the rapid rise in water discharge from the cone valve, sediment transport is likely substantial and turbidity levels are likely high. The turbidity plumes likely extend well beyond the confluence of Calaveras and Alameda Creeks; however, the effect is temporary during the testing period. Cone valve releases during periods of reservoir drawdown are timed with periods of high inflow into Calaveras Reservoir. Turbidities of the high flows likely are sustained throughout the cone valve release period; however, these are approximately coincident with large storm events across the watershed and thus probably are equivalent to or masked by turbidities throughout the broader Alameda Creek system. Depending on reservoir level and the need to make releases, the cone valve releases entail a lag time (attenuation) in releases into the creek beyond the natural decline in stream flows following large winter and spring storms. Thus, cone valve releases may entail a somewhat extended period of turbidity in Alameda Creek downstream of the confluence with Calaveras Creek.

Table 4.7.5: Summary of Water Quality Measurements Taken During Electro-Fishing (Autumn and Winter Single Samples), Calaveras Creek

Year	Station / Site Number	pH	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Conductivity (µS/cm)
1998	2 ¹	7.85	7.9	0	1,140
1999	2 ²	Not measured	4.42	1	1,150
2000	2-1 ³	8.04	7.9	0.6	Not measured
2000	8-1 ⁴	7.83	NA	0.3	Not measured
2001	8-1 ⁴	7.7	3.7	0.6	Not measured
2001	8-2 ⁴	7.5	3.4	0.72	Not measured
2002	8-1 ⁴	7.83	4.8	0.61	Not measured
2002	8-2 ⁴	7.5	2.7	0.63	Not measured
2003	8-1 ⁴	7.64	6.5	0.32	1,100
2003	8-2 ⁴	7.28	2.8	0.86	1,380
2004	8-1 ⁴	7.07	5.8	1.3	1,033
2004	8-2 ⁴	7.08	2	0.53	1,059
2005	8-1 ⁴	7.74	5.1	0.76	1,537
2005	8-2 ⁴	7.46	3.3	0.37	1,534

Notes:

mg/L = milligrams per liter (1 mg/L = 1 part per million)

NTU = Nephelometric Turbidity Unit

µS/cm = microSiemens per centimeter

¹ Site 2 (Reach 2) is a glide approximately 1,000 feet upstream of the Alameda Creek/Calaveras Creek confluence.

² Site 2 (Reach 2) is located approximately 1,100 feet upstream of the Alameda Creek/Calaveras Creek confluence.

³ Station 2-1 is a glide approximately 1,100 feet upstream of the Alameda Creek/Calaveras Creek confluence.

⁴ Sites 8-1 and 8-2 are isolated pools on Calaveras Creek, near the walkway paralleling the Calaveras Pipeline.

Sources: SFPUC 1999 (p. 4-14, Table 4.3), SFPUC 2001a (Table 4.3), SFPUC 2002a (p. 5-7, Table 5-3), SFPUC 2002b (p. 5-10, Table 5-3), SFPUC 2004 (p. 5-10, Table 5-3), SFPUC 2005 (p. 5-21, Table 5-5), SFPUC 2006a (p. 5-19), SFPUC 2007 (p. 5-18, Table 5-5)

Groundwater

Groundwater Resources

The main groundwater resources in the Alameda Creek watershed are not located in the primary study area; rather, they are located in the Livermore Valley, which is part of the Arroyo Mocho and Arroyo Valle in the Arroyo de la Laguna watershed (not included in the study area); in the Sunol Valley at the northern lower end of the Alameda Creek drainage; and in the lowest part of the Alameda Creek watershed farther downstream in the Niles Cone area near the town of Niles

(in the extended study area). The project area is located approximately 3 miles south of and upgradient of the Sunol Valley groundwater basin and approximately 5 miles east of the Niles Cone and adjacent Santa Clara sub-basins of the Santa Clara Valley groundwater basin. Additional detail on groundwater resources in the Alameda Creek watershed is provided in Section 4.6.1.1, Existing Conditions, in Section 4.6, Hydrology.

Groundwater Quality

A sodium chloride groundwater type predominates along the western margin and center of the Niles Cone groundwater sub-basin near San Francisco Bay but does not extend into the study area. TDS in the groundwater sub-basin ranges from about 286 mg/L to 39,734 mg/L and averages 2,204 mg/L based on data from 113 wells (DWR 2006). Groundwater within the Sunol Valley area is calcium-magnesium bicarbonate water, with concentrations of individual constituents at generally low levels. TDS concentrations are low (from about 350 to 500 mg/L), as are nitrate (NO₃) concentrations (from 1 to 6 mg/L), with the exception of some localized and elevated NO₃ and TDS concentrations in shallow groundwater due to historical farming and nursery operations (Bookman-Edmonston Engineering 1993, p. 29). Monitoring wells were installed just north of the Alameda Creek and Calaveras Creek confluence for the ACWD groundwater exploration effort in 1986 and some groundwater samples were collected. The constituent concentrations in these samples are shown in Table 4.7.6 and indicate values well within Basin Plan water quality objectives.

Table 4.7.6: Groundwater Quality Data at Alameda Creek and Calaveras Creek Confluence

	Electrical Conductivity (µmhos/cm)	TDS (mg/L)	Chloride (mg/L)	NO ₃ as NO ₃ (mg/L)	Boron (mg/L)
Data from Samples Collected 8/20/1986	590	377	19	1	0.9
Basin Plan Water Quality Objective	900	Ambient or 500 mg/L (whichever is lower)	250	45	
<i>Notes:</i> Data obtained for Well EB-6. µmhos/cm = micro-mhos per centimeter, TDS = total dissolved solids, mg/L = milligrams per liter (1 mg/L = 1 part per million) NO ₃ = nitrate.					

Sources: Bookman-Edmonston Engineering 1995, Table 3; RWQCB 2006

4.7.1.2 REGULATORY FRAMEWORK

Subsection 4.7.1.2 Contents

Federal Regulations

Clean Water Act

Section 404

Section 402

Section 401

Section 303(d)

State Regulations

California Water Code

Porter-Cologne Water Quality Control Act

California Toxics Rule and State Implementation Policy

California Fish and Game Code – Section 1602

Regional/Local Regulations (Alameda Watershed Management Plan)

Federal Regulations

Clean Water Act

The Clean Water Act (CWA), enacted by Congress in 1972 and amended several times since inception, is the primary federal law regulating water quality in the U.S. Its objective is to reduce or eliminate water pollution in the nation's rivers, streams, lakes, and coastal waters. The CWA prescribes the basic federal laws for regulating discharges of pollutants into waters of the U.S., including setting water quality standards for contaminants in surface waters, establishing wastewater and effluent discharge limits from various industry categories, and imposing requirements for controlling nonpoint-source pollution.

Section 404

At the federal level, Section 404 of the CWA is administered by the U.S. Army Corps of Engineers (USACE). Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the U.S., including wetlands. Activities in waters of the U.S. regulated under this program include fill for development, water resource projects, infrastructure development, and mining projects. Section 404 requires a permit before dredged or fill material can be discharged into waters of the U.S., unless the activity is exempt from Section 404 regulation.

Section 402

CWA Section 402 regulates construction-related stormwater discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program, administered by the U.S. Environmental Protection Agency (USEPA). In California, the SWRCB is authorized by the

USEPA to oversee the NPDES program through the nine RWQCBs. The project site is located within the jurisdiction of and is regulated by Region 2, San Francisco Bay RWQCB.

The NPDES General Permit for Storm Water Discharges Associated with Construction Activity (or General Permit) are required for projects that disturb more than 1 acre of land. The current General NPDES Permit that covers stormwater discharges is Order No. 99-08-DWQ. The NPDES permitting process requires the applicant to file a public Notice of Intent to discharge stormwater and to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP includes a site map and a description of proposed construction activities. In addition, it describes the Best Management Practices (BMPs) that will be implemented to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, cement) that could contaminate nearby water resources. Permittees are required to conduct annual monitoring and reporting to ensure that BMPs are correctly implemented and effective in controlling the discharge of stormwater-related pollutants.

In the past, the SFPUC has used copper sulfate in Calaveras Reservoir to control algae growth. The SFPUC is not currently using copper sulfate in Calaveras Reservoir; however, it may be used in the future if the SWRCB permits its use and if alternative herbicides such as sodium percarbonate fail to produce results. While there has been legal challenge to the rule requiring an NPDES permit for the application of pesticides to water, an NPDES permit would still be required.

Section 401

Under Section 401 of the CWA, an applicant seeking a Section 404 CWA permit for a project that could result in a discharge into waters of the U.S. must obtain a certification from the state that confirms that the discharge will comply with state water quality standards. The RWQCBs administer the Section 401 program with the intent of prescribing measures that are necessary to avoid, minimize, or mitigate adverse project impacts on water quality and ecosystems and assure compliance with state water quality standards.

Section 303(d)

Section 303(d) of the CWA, which is administered by the RWQCBs, requires each state to maintain a list of water bodies in which water quality standards are not attained after implementation of technology-based effluent limits and water-quality-based effluent limits. Section 303(d) requires preparation of a total maximum daily load (TMDL) program for waters identified as impaired. TMDLs are determined based on a quantitative assessment of the pollutant sources, contaminant loads, the assimilative capacity of the water body for the specific contaminants, and the allocation of specific load reduction targets that are necessary to ensure compliance with the water quality standards. The listing of a water body as impaired does not

necessarily suggest that the water body cannot support the beneficial uses; rather, the intent is to identify the water body as requiring future development of a TMDL to maintain water quality and reduce the potential for future water quality degradation. NPDES permits for water discharges must take into account the pollutant for which a water body is listed as impaired. Specific requirements for the permits would be specified in the TMDL for that pollutant.

Alameda Creek is identified on the Section 303(d) list of impaired water bodies, as compiled by the SWRCB and approved by the USEPA, for diazinon (see Table 4.7.7). The primary study area likely contributes very little to the diazinon contaminant load, as diazinon is an insecticide associated with urban areas, where it was formerly used to control cockroaches, silverfish, ants, fleas, and wasps. The USEPA banned the use of diazinon in 1988. The San Francisco Bay RWQCB developed a TMDL and water quality attainment strategy to address this impairment in 2006, and the USEPA approved the TMDL and strategy in May 2007.

Table 4.7.7: Section 303(d) List of Water Quality Limited Segments Requiring TMDLs

Water Body	Pollutant
Alameda Creek	Pollutant: Diazinon Potential Sources: Urban runoff/storm sewers Note: The USEPA moved diazinon from the 303(d) list to the “being addressed” list because of a completed USEPA-approved TMDL. Total Maximum Daily Load Priority: High

Source: SWRCB 2003

State Regulations

California Water Code

The California Water Code, administered by the California Department of Water Resources, contains the fundamental provisions related to management of the state’s water resources. The California Water Code requires that water resources of the state be put to beneficial use to the fullest possible extent, and that waste, unreasonable use, or unreasonable method of use be prevented. Acts contained under the California Water Code include the Water Reuse Law, the California Water Recycling Act, and the Integrated Regional Water Management Planning Act.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Porter-Cologne) was passed by the state legislature in 1969 and is the primary state statute covering the quality of waters in California. The act specifies water quality provisions and discharge requirements for regulating the discharge of waste that could affect the quality of state waters. Under the act, the SWRCB has the ultimate

authority over state water rights and water quality policy. The RWQCB is responsible for the oversight of water quality on a day-to-day basis.

The RWQCB designates beneficial uses and establishes water quality objectives within the Basin Plan under the authority of Porter-Cologne, the CWA, and general provisions of California Water Code Section 13000 (RWQCB 2006). Table 4.7.1 presents a summary of the beneficial uses for Alameda Creek, Arroyo Hondo, and Calaveras Reservoir. Beneficial uses for Calaveras Creek are not identified in the Basin Plan.

Under Porter-Cologne, the RWQCBs regulate the discharge of waste to waters of the state. The terms “discharge of waste” and “waters of the state” are broadly defined in Porter-Cologne, such that discharges of waste include fill, any material resulting from human activity, or any other discharge that may directly or indirectly affect waters of the state. Waters of the state include any surface water or groundwater, including saline waters, within the boundaries of the state. This jurisdiction includes waters (including wetlands and isolated wetlands) the USACE deems to be isolated or non-jurisdictional with respect to the *SWANCC and Rapanos* U.S. Supreme Court decisions.² All parties proposing to discharge waste that could affect waters of the state must file a report of waste discharge with the RWQCB, which will then respond to the report by issuing Waste Discharge Requirements (WDRs) in a public hearing, or by waiving WDRs (with or without conditions) for that proposed discharge. A WDR may also be issued in addition to a water quality certification under Section 401 of the CWA.

As noted above, each RWQCB is required to develop, adopt, and implement a Water Quality Control Plan, also known as a Basin Plan, for its respective region. The San Francisco Bay Basin Plan is relevant to the project area lands, and the Office of Administrative Law recently approved revisions to the plan. The Basin Plan is the master policy document that contains descriptions of the legal, technical, and programmatic basis of water quality regulation. Basin Plans identify beneficial uses of surface waters and groundwater within the corresponding region; specify water quality objectives and standards for both surface water and groundwater; and develop the actions necessary to maintain the standards in order to control nonpoint and point sources of pollutants to the state’s waters. Beneficial uses of surface and groundwaters in the project area, as well as impaired water bodies, are shown in Table 4.7.1. The beneficial uses of the water bodies generally apply to all tributaries. All discretionary projects requiring permits from the RWQCB (i.e., WDRs and NPDES permits) must implement Basin Plan requirements, taking into consideration the beneficial uses to be protected.

California Toxics Rule and State Implementation Policy

In 2000, the USEPA promulgated the California Toxics Rule (CTR) in response to requirements of its National Toxics Rule (NTR). The CTR criteria are regulatory criteria adopted for inland

² *Rapanos v. United States*, 547 U.S. 715 (2006). *Solid Waste Agency of Northern Cook County (SWANCC) v. United States Army Corps of Engineers*, 531 U.S. 159 (2001).

surface waters, enclosed bays, and estuaries in California that are subject to regulation pursuant to Section 303(c) of the CWA. The NTR and CTR include criteria for the protection of aquatic life and human health. Human health criteria (water and organisms) apply to all waters with a Municipal and Domestic Water Supply Beneficial Use designation as indicated in the RWQCBs' Basin Plans. In 2000, the SWRCB adopted the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, also known as the State Implementation Plan, to establish provisions for translating CTR criteria, NTR criteria, and Basin Plan water quality objectives for toxic pollutants into the following:

- NPDES permit effluent limits;
- Compliance determinations;
- Monitoring for 2,3,7,8-TCDD equivalents;
- Chronic toxicity control provisions;
- Conditions for initiating site-specific objective development; and
- Conditions for granting exceptions.

California Fish and Game Code – Section 1602

Rivers, streams, and lakes in California are subject to regulation by CDFG pursuant to Section 1602 of the California Fish and Game Code. Any changes proposed along a creek or waterway within CDFG jurisdiction require a Streambed Alteration Agreement. Please refer to Section 4.4, Vegetation and Wildlife, for additional information.

Regional/Local Regulations (Alameda Watershed Management Plan)

The *Alameda Watershed Management Plan* provides a policy framework for the SFPUC to make consistent decisions about the activities, practices, and procedures that are appropriate on lands owned by the City and County of San Francisco in the Alameda Creek watershed to protect the watershed and ensure a pure and reliable water supply for San Francisco. The plan is the current primary operating tool for the watershed, including the project study area, as it provides a comprehensive set of goals, policies, and management actions that integrate all watershed resources. The SFPUC Natural Resources Division, Land and Resource Management Section manages the watershed lands. The plan applies BMPs for the protection of water and natural resources and their conservation, enhancement, restoration, and maintenance and is intended to be used by the SFPUC as watershed management implementation guidelines. The goals and policies of the plan are organized around the primary goal of water quality protection and six secondary goals pertaining to water supply, natural resource protection, watershed protection, land use compatibility, fiscal management, and public awareness.

Water quality policies call for maintaining a minimum 300-foot disturbance-free buffer around water bodies in the watershed; preventing pollutants from entering the water by limiting new roads and other activities that contribute to erosion; and requiring regular water quality monitoring.

4.7.2 IMPACTS

4.7.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to water quality, but generally considers that implementation of the proposed project would have a significant water quality impact if it were to:

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted);
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off the site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off the site;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
- Otherwise substantially degrade water quality.

4.7.2.2 APPROACH TO ANALYSIS

Impacts on water quality that could result from project construction activities and project operation were qualitatively evaluated based on design and construction elements of the proposed project. Impacts that could result from project operations were evaluated based on proposed project-related management of Calaveras Reservoir levels, changes in releases from Calaveras Dam, and diversions, sluicing, or bypass flows from the ACDD.

Note that some of the significance criteria (e.g., erosion and stormwater impacts) are evaluated in Section 4.6, Hydrology, and only the water quality aspects of those related impacts are discussed in this section.

Pursuant to regulations set forth by the CWA and as described in the General NPDES Permit, BMPs have been included in Mitigation Measure 5.7.1, Storm Water Pollution Prevention Plan (SWPPP). These BMPs are accepted practices that have been found to be successful at achieving Basin Plan water quality objectives. The BMPs listed in Mitigation Measure 5.7.1 are standard measures that are commonly used on projects and have been demonstrated to be effective. As requirements under a SWPPP, BMP implementation, maintenance, and performance are enforceable, as the BMPs are part of a regulatory program that applies penalties if the program goals are not satisfactorily achieved.

This document considers the indirect impacts resulting from changes in water quality; however, for organizational purposes, these indirect impacts are not evaluated in this Water Quality section but in the sections describing the resources that would be indirectly affected by the changes in flows and reservoir water levels. These resources include vegetation and wildlife, fisheries and aquatic habitat, hydrology, and hazards and hazardous materials (Sections 4.4, 4.5, 4.6, and 4.9, respectively).

Drinking water standards, established by the Safe Drinking Water Act, were put in place to protect public health and regulate public drinking water supplies derived from various sources, including rivers, lakes, reservoirs, springs, and groundwater wells. Drinking water regulations and Maximum Contaminant Levels (MCLs) have been established to identify the highest level of a contaminant that is allowed in drinking water. The USEPA has set the MCL for asbestos at 7 million fibers per liter of water because the USEPA believes this level of protection would not cause potential health problems (USEPA 2006). All impacts related to a potential violation of drinking water quality standards have been determined to be less than significant, as prior to distribution, water from Calaveras Reservoir is treated at the SVWTP. Treatment processes include coagulation, flocculation, sedimentation, filtration, and disinfection. These processes would remove or substantially reduce concentrations of asbestos and metals in drinking water. Furthermore, any elevated concentrations of asbestos or metals in water prior to treatment would be expected to be short-term in duration during construction. In general, health concerns related to asbestos and metals in drinking water are related to chronic exposure over extended periods of time. Asbestos exposure in drinking water is not known to cause any health problems with short-term exposure (USEPA 2006). At times, the ACWD diverts water from Alameda Creek into the quarry lake recharge basins to recharge their groundwater supplies. While asbestos fibers may be carried long distances by water before settling, the fibers do not migrate to groundwater through soils (USEPA 2006).

The SFPUC proposes to undertake the project in compliance with all pertinent *Alameda Watershed Management Plan* policies and actions. As such, this analysis assumes that the following actions pertaining to erosion and sedimentation would be implemented as part of this project:

- **Action aqu1.** Prior to undertaking or constructing any non-water-dependent facility or watershed activity, conduct site-specific review in conjunction with the review process for proposed plans and projects to ensure that the facility or activity is not located within a High Water Quality Vulnerability Zone. If feasible, relocate the activity or facility to an alternative upland site.
- **Action veg4.** Prior to the initiation of any construction project involving grading, a grading plan shall be prepared by the project proponent and approved by appropriate SFPUC staff. Revegetation of all graded areas shall be required to the maximum extent practicable.
- **Action veg7.** When conducting operations, maintenance, and construction activities, follow erosion control BMPs to ensure protection of wetlands, streams, and shoreline areas. BMPs to be employed in the vicinity of wetlands and riparian areas shall be coordinated with the requirements of the CDFG Streambed Alteration Agreement and Clean Water Act Section 404 permit from the Army Corps of Engineers.

The SFPUC is proposing to implement flow releases consistent with the flow criteria described in the 1997 MOU to support native fishes in Alameda Creek as part of the proposed project. As further presented in Section 3.6.5, Resident Rainbow Trout Flow Releases, flows would be provided through the proposed ACDD bypass tunnel whenever sufficient water is available in Alameda Creek and water would be released from Calaveras Reservoir through the proposed low-flow release valves during dry periods to meet the MOU flow and temperature criteria. Because the flow releases described in Section 3.6.5 are proposed as part of the project, the impact analysis below assumes their implementation under the future operations of the CDRP.

In addition to the Resident Trout Flow Releases, which were developed to support resident rainbow trout, the SFPUC also proposes to implement flow release schedules to support steelhead in the watershed in the future when steelhead have regained access upstream of the BART weir as determined by NMFS as further described in Section 3.6.6, Steelhead Flow Releases, and Section 6.2, Cumulative Impacts. Although the Steelhead Flow Releases would also benefit water quality in Alameda and Calaveras Creeks, implementation of these additional flow releases will only occur when steelhead regain access upstream of the BART weir. Because restoring steelhead access to the watershed requires actions that are outside of the control of the SFPUC, the timing and implementation of the proposed Steelhead Flow Releases is uncertain. Therefore, for purposes of providing a conservative, worst-case disclosure of the potential effects of the CDRP on water quality, implementation of the Steelhead Flow Releases is not assumed in the impact analysis below.

4.7.2.3 PROJECT IMPACTS

Table 4.7.8 summarizes the project-related impacts on water quality described in this section.

Table 4.7.8: Summary of Water Quality Impacts

Impact	Level of Significance
4.7.1: Impact on water bodies as a result of soil erosion and sediment discharge during construction.	LSM
4.7.2: Impact on water bodies as a result of a hazardous materials release, NOA or metals release, or solid waste discharge during construction.	LSM
4.7.3: Impact on water bodies as a result of erosion and sediment discharge or a hazardous materials release associated with construction of barge docking facilities and during barging operation.	LSM
4.7.4: Impact on reservoir water quality during and following inundation due to contact with borrow materials containing NOA, metals, or contaminants.	LSM
4.7.5: Changes in water quality parameters in Calaveras Reservoir during future operation and restoration of pre-DSOD-restricted reservoir conditions.	B
4.7.6: Changes in water quality parameters in Calaveras and Alameda Creeks during future operation.	LS
4.7.7: Changes in groundwater quality related to construction and operations.	LSM
<i>Notes:</i> LS – Less than significant LSM – Less than significant with mitigation B – Beneficial impact	

Construction Impacts

Impact 4.7.1: Impact on water bodies as a result of soil erosion and sediment discharge during construction.

Project construction would require the excavation and transportation of large quantities of material that could enter watercourses through several means, including wind erosion, water erosion, and mechanical abrasion of earthen materials in exposed work areas and from spillage from mechanical equipment and haul trucks. Clearing of vegetation and grading would expose soils and rock materials to erosion over a large composite area of approximately 343 acres. Fill areas would be exposed to potential erosion until stabilized by vegetation cover. Uncovered stockpiles of soil or areas where vegetation has been cleared (e.g., borrow areas, staging areas, disposal sites, and haul roads) are susceptible to both water and wind erosion. Surface runoff water can pick up soil particles and transport them in overland flow for deposition into receiving waters. Approximately 3 miles to 6.4 miles of unimproved haul roads³ would be intensely used for approximately 4 years throughout the construction period, which would result in the

³ In the event that the west haul road (Option 1) is implemented, an additional 3.4 miles of road would be constructed. See Subsection 3.5.1.7, Access and Roads, in Chapter 3, Project Description, for additional information on project area roads and road types.

mechanical abrasion of roadways and the potential for sediment discharges into nearby waterways. Construction vehicles would transport fill materials to the project site and would track mud and dirt onto the site, with the subsequent potential for sediment discharges into Alameda Creek. Construction dewatering discharges, blasting, and pile-driving activities would result in erosion and sediment discharges into Calaveras Reservoir, Calaveras Creek, and Alameda Creek. Soil erosion and sediment discharges into creeks and the reservoir constitute one of the most significant potential impacts of project construction. High turbidity due to sediment can lead to increased water temperatures and decreased DO concentrations, as well as nutrient loading, all of which individually or in combination can be detrimental to water quality and aquatic species. Excessive sediment discharge into a water body can result in sediment accumulation in the channel and is termed sedimentation. Sedimentation changes the bed characteristics of the water body, can reduce the infiltration capacity of the creek or reservoir bottom, and can smother aquatic vegetative growth and biota. Sediment transport due to changes in stream flow conditions is discussed in Section 4.6, Hydrology. The effects of sedimentation on fisheries and aquatic habitats are discussed in Section 4.5, Fisheries and Aquatic Habitat.

Soils in the project construction areas are highly erodible and include sandy soils located on steep slopes. The erosion hazard in such areas is rated as severe. In the landslide area, soils have been displaced, loosened, and mixed due to the landslide movements and thus are highly erodible. The valley floor itself has young (Quaternary) alluvium that is generally erodible. While slopes are not steep in the valley floor, they are subject to high flows in the creek and wash from adjacent slopes. In addition, the fill materials in the dam would be highly erodible when the protective cover material is removed during excavation. The work areas around the dam and spillway construction sites, the associated borrow sites, and the right-abutment landslide area are subject to significant erosion hazards. Removal of stabilizing vegetation during construction would substantially increase the erosion hazard during and following construction.

The following construction activities could result in water quality impacts on Calaveras and Alameda Creeks due to erosion and sediment discharge:

- Excavation of the dam foundation and access (about 14.6 acres) and spillway (about 3.6 acres);
- Staging of construction materials and equipment comprising in total of 16.4 acres, including Staging Area 1 (about 3.8 acres), Staging Area 4 (about 1.2 acres), Staging Area 5 (about 1.1 acres), Staging Area 6 (about 0.9 acre), Staging Area 7 (about 2.5 acres), Staging Area 8 (about 3 acres), Staging Area 9 (about 2.9 acres), and Staging Area 10 (about 1 acre);
- Excavation of cuts and borrow material from proposed borrow sites including Borrow Area B (770,000 cubic yards of material removed over a combined area of about 8 acres), Borrow Area B access (1.7 acres), and Observation Hill access (about 11.6 acres);

- Construction of haul roads (North Observation Hill Road [about 0.4 acre] and Observation Hill Road [about 0.6 acre] are on slopes directly above Calaveras Creek; in total, six roads would include about 39.6 acres of disturbance);
- Phased stabilization of the right-abutment landslide (about 11 acres);
- Blasting (dispersal of sediments);
- Transportation of fill materials from borrow areas on the project site and from off-site sources and transport of unusable soil and rock to disposal sites (about 3 miles of roads);
- Placement and grading of fill (fill areas for the dam embankment and right landslide repair would occur within areas disturbed by excavations); and
- Staging (approximately 0.25 acre) and construction of the ACDD bypass facility.

Construction activities that could result in erosion and sediment discharge impacts in Calaveras Reservoir would include:

- Construction and placement of fill at Disposal Sites 2, 3, and 7 (combined about 56 acres) and Disposal Site 5 (about 85 acres);
- Excavation of Borrow Area E (about 85 acres – 60 acres then filled as Disposal Site 5);
- Construction and use of haul roads, particularly the west haul road (about 35 acres) located along the reservoir shore;
- Grading and use of Staging Areas 1, 2, 3, 4, 6, 9, and 11; and
- Barge docking fill at the north end of the reservoir and channel cut at the south end of the reservoir as well as material transport. (Impacts associated with the barging option are discussed under Impact 4.7.3.)

These construction activities are discussed in further detail below for individual construction areas. The potential water quality impacts from erosion and sediment discharge during project construction would be substantial because of the great extent of construction earth moving and soil disturbance activities, the large quantity of materials being handled and transported, and the need for in-channel excavation, grading, and construction. Essentially, all sediment that is discharged into the reservoir would temporarily increase turbidity and would be permanently trapped behind the dam. Additionally, fine suspended sediment could be discharged into Calaveras Creek during cone valve releases, should releases be necessary during the construction period. As almost all sediment discharged into the reservoir would be trapped, it would reduce the reservoir storage capacity. High turbidity could increase the amount of treatment needed to remove the sediment (particularly fine suspended sediment and material in solution) for water at the SVWTP. These treatment processes already are in place at the SVWTP and, thus, the increased turbidity of raw water drawn from Calaveras Reservoir during construction and thereafter would not require any new facilities. Turbidity could have adverse effects on aquatic life in the reservoir, as discussed in Impact 4.5.4 in Section 4.5, Fisheries and Aquatic Habitat. Sediment plumes also would add nutrients to the lowered reservoir pool and could thereby

increase algal growth. In response, increased operation of the HOS may be needed to reduce those impacts related to management of in-reservoir water quality. Therefore, erosion and sediment discharge during project construction could have a significant impact on the water quality of Calaveras Creek, Alameda Creek, and Calaveras Reservoir.

Potential water quality impacts from erosion and sediment discharge during project construction would be mitigated through the implementation of a SWPPP that contains, at a minimum, the project-specific BMPs set forth in Mitigation Measure 5.7.1. These BMPs are standard, accepted practices that have been successful at achieving Basin Plan standards and maintaining beneficial uses. There are additional BMPs included in Mitigation Measure 5.7.1 that are not normally part of mitigation measures for the SWPPP; however, due to the extent of excavation and transportation of material and the nature of soils present at the project site, the addition of additional measures was determined to be appropriate. As specified by Mitigation Measure 5.7.1, BMPs would be implemented during construction to minimize erosion and sediment transport from the construction areas, haul roads, borrow areas, laydown/staging areas, disposal sites, and dewatering activities. These measures include erosion and sediment controls tailored to the site and project. Construction would be phased to minimize the area disturbed at any one time. Mitigation Measure 5.7.1 also requires frequent inspection and maintenance of the BMPs throughout project construction to ensure their effectiveness, and requires the SFPUC or its contractors to monitor and report on the effectiveness of the required BMPs. In addition, Mitigation Measure 5.7.1 requires the SFPUC or its contractor(s) to immediately notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and the East Bay Regional Park District (EBRPD) in the event of elevated turbidity in any waterways in the Alameda Creek system within the area of the project's potential effects.

Replacement Dam Site

The construction of the replacement dam would require 2.77 million cubic yards of material, would have a footprint of about 18 acres, and would be exposed for lengthy periods to erosive processes in both the wet and dry seasons. The replacement dam would be constructed just downstream of the existing Calaveras Dam. Approximately 945 linear feet of channel would be permanently excavated and then filled by dam earth materials by the project, and approximately 78 linear feet of channel would be temporarily disturbed by construction. In-channel construction would expose the in-stream alluvium. Approximately 2.325 million cubic yards of material would be excavated for the dam foundation, providing high potential for sediment to be released into the creek. This excavation activity includes the removal of the downstream face of the existing dam (150,000 cubic yards of material).

Given the size of the impact area, its location within an existing creek, the high degree of soil disturbance related to earthmoving and construction activity at the dam site and immediately

surrounding areas, and the steep slopes on which some of the earth disturbance would occur (e.g., the right abutment landslide stabilization and spillway excavation area), the potential is high for these materials to erode and result in increased sediment discharges to surface waters. The impact would have high potential to reduce water quality in Calaveras Creek as related to sediment and turbidity plumes. Sedimentation of parts of the creek would be a potentially significant result of these discharges, particularly following storm events. As sediment and turbidity plumes would be carried downstream, Alameda Creek would similarly have potentially significantly reduced water quality that would diminish its beneficial uses, notably habitat for cold-water and warm-water fishes, fish migration, and spawning (see discussion under Impact 4.5.4, Section 4.5, Fisheries and Aquatic Habitat). Turbidity plumes may also reduce the aesthetic quality of the creek water and at times potentially at the ACWD Quarry Lakes (which also are part of a water-oriented recreational park) and thereby reduce the quality of beneficial uses for both water contact and non-water contact recreation. Thus, construction related sediment discharges would constitute a significant impact on Alameda Creek water quality.

The impacts on beneficial uses related to water supply (groundwater recharge and freshwater replenishment) could also be potentially significant downstream in Alameda Creek. The impacts may be similar to those associated with the existing natural range in sediment discharges in Alameda Creek and its related turbidity, (e.g., during large storm flows). However, if construction-related discharges are added to high natural sediment loads and turbidity during and after large storm events, the combined effects could increase substantially. The effects would be attenuated over the long distances to downstream water supply collection facilities at the Sunol infiltration galleries and the ACWD Quarry Lakes recharge areas. Nonetheless, fine sediment would settle out in still water areas, fill the interstices of the coarse sediments, and result in reduced infiltration capacity at those recharge facilities. This would constitute a significant impact of the project.

Work within the Calaveras Creek channel would necessitate special consideration to avoid the direct discharge of sediment into the downstream reach of Calaveras Creek. Construction of the outlet conduit extension would occur during the first year of construction, serving to dewater the section of Calaveras Creek located directly downstream of the existing dam. Additional dewatering operations to control seepage, as described below, would serve to keep the area dry and protected from erosive, concentrated flows.

Mitigation Measure 5.7.1 identifies specific construction BMPs that could feasibly mitigate potential impacts on water quality during construction of the replacement dam. Accordingly, erosion control blankets and geotextiles would be used within the Calaveras Creek channel and to protect steep slopes from erosion, particularly during the rainy season. Slope protection and sediment control measures, including fiber rolls, velocity dissipation devices, hydraulic mulch, soil binders, hydroseeding, and other devices, would be used during construction. By using fiber

rolls to reduce the effective slope length or berms/diversions at the top of slopes, runoff would be safely conveyed from the tops of slopes to minimize erosion potential from sheet flow.

Until the downstream surface of the replacement dam is hydroseeded for erosion control and the vegetative cover becomes established, there would be the potential for dam construction material to erode directly into Calaveras Creek. To reduce this potential impact, Mitigation Measure 5.7.1 requires erosion control fabrics to be installed to control erosion and assist in vegetative growth. After the replacement dam is completed, the downstream slope of the dam would be a vegetated slope and would have benches and drainage ditches to convey runoff to ditches and abutments. Riprap would be installed on the upstream slope of the dam to protect against wave erosion.

In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout the duration of project construction. Disturbed sites would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements. During the rainy season, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project. With the implementation of Mitigation Measure 5.7.1, which includes accepted BMPs that have been demonstrated to be effective at achieving Basin Plan water quality objectives and maintaining beneficial uses, the potential impacts on water quality from erosion and sedimentation at the replacement dam site would be less than significant.

Dewatering

During project construction, groundwater encountered during excavation at the construction sites, including the sites of the proposed replacement dam and spillway, borrow sites, and disposal sites, would be controlled by a system of dewatering sumps, wells, and pumps. In addition,

surface runoff could collect in excavated areas, adding to the total volume of water that would need to be removed. Water produced during construction dewatering would contain sediment and may contain construction-related contaminants that could degrade water quality if the water were discharged directly to surface water. The discharge of such water could exceed Basin Plan objectives, resulting in a significant impact on water quality. Impacts related to the infiltration to groundwater of water produced during construction dewatering are discussed in Impact 4.7.7.

In accordance with Mitigation Measure 5.7.1, the SWPPP would include a dewatering plan designed to address potential water quality impacts from construction site dewatering. Mitigation Measure 5.7.1 specifies that water produced from dewatering would be impounded and treated to comply with Basin Plan standards prior to discharge to receiving waters. However, the SFPUC has indicated that if a 10-year or greater storm event occurred during project construction, the combined volume of runoff and water produced from dewatering could exceed the capacity of the detention and treatment system, resulting in the discharge of untreated water. Water discharged under such circumstances could exceed Basin Plan water quality objectives for turbidity.

Therefore, in accordance with Mitigation Measure 5.7.1, if untreated water that exceeds Basin Plan water quality objectives were discharged to receiving waters, the SFPUC would implement an off-site erosion control project or projects to offset impacts on water quality. Offset projects could include gully repairs, stream bank stabilization, slide repairs, or other actions acceptable to the RWQCB that would reduce or mitigate sources of sediment affecting Alameda Creek or its tributaries. Implementation of the dewatering plan, impoundment and treatment of water produced by construction site dewatering, and offsets (if necessary) as required by Mitigation Measure 5.7.1 would ensure that the impacts of construction-related dewatering discharges on water quality would be less than significant.

Spillway Excavation and Construction

Excavation of the spillway from the top of Observation Hill would begin in the third season of construction, and final excavation and most of the concrete placement would occur in the fourth year. Excavation of the stilling basin would occur during the first year of construction.

Excavation of the spillway would remove 1.87 million cubic yards of material, some of which would be used in the construction of the replacement dam and the remainder disposed of between the existing and replacement dams (Disposal Site 2). Excavation would be done in this area using ripping or blasting techniques. The slopes of Observation Hill are steep, and the proposed excavation would expose a large amount and area of the native soils and rock to high erosion. Soil and rock exposed during spillway excavation would be discharged to surface waters in Calaveras Creek and eventually Alameda Creek and result in significant impacts on their water quality, as previously discussed.

To reduce erosion potential during spillway excavation and construction, the SFPUC proposes to grade the area on the slopes above the spillway into a series of benches where possible and to vegetate the graded benches. In addition, shotcrete and rockbolts would be placed where needed as the spillway is excavated. Additionally, just prior to operation, the spillway would undergo a final mechanical cleaning to remove rocks, shotcrete particles, and sediment. Water that accumulates from cleaning activities would be collected and treated prior to discharge, and the debris and sediment produced from cleaning the foundation surfaces would be placed in one of the disposal sites. However, even with these proposed avoidance measures, the remaining erosion and sediment discharge effects on the creek during spillway excavation and construction could be significant due to the size of the spillway excavation area and the large quantity of material involved. Substantial increases in turbidity could occur in the water and sedimentation of parts of the Calaveras Creek channel could result.

To further reduce the potential erosion and sediment discharge impacts during spillway excavation and construction, Mitigation Measure 5.7.1 requires the project SWPPP to include preparation of a dewatering plan. In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout the duration of project construction at this site. Disturbed sites would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements. During the rainy season, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project. Treatment, including sedimentation or coagulation/flocculation (if necessary in NOA-containing areas), would be conducted to treat collected water prior to discharge. With the implementation of these measures, which have been demonstrated to be effective at achieving Basin Plan water quality objectives and maintaining beneficial uses, the erosion and sedimentation impacts during spillway excavation and construction would be less than significant.

Staging Areas

Several staging areas would be located along access roads at the northern side of the reservoir, and one would be located at the southern end of the reservoir, adjacent to Borrow Area E/Disposal Site 5. Eroded soils from the staging area at the southern end of the reservoir and from the staging areas at the northern end of the reservoir could be discharged into Calaveras Reservoir. Three staging areas (areas 5, 7, and 8) would be located near the replacement dam and spillway construction area and would drain into Calaveras Creek. Two other staging areas (areas 9 and 10) are in the dam vicinity but would drain toward the reservoir. Erosion and sediment discharge from these staging areas, as well as discharge of contaminants present at the staging areas related to materials for construction and vehicle/equipment operation, both during and following the completion of construction, could have significant impacts on turbidity, pH, and other components of water quality.

Mitigation Measure 5.7.1 requires construction BMPs to minimize erosion and sediment discharge impacts associated with construction staging areas. During construction, BMPs to control turbidity, including the installation of turbidity barriers as needed and the collection and treatment of drainage and runoff prior to discharge to receiving waters, would help to meet Basin Plan water quality objectives. In addition, erosion and sediment control measures, such as the installation of silt fences or straw-waddle barriers between stockpiles and creek channels, drainage channels, and drainage swales, would prevent runoff from entering the creek or reservoir. Stockpiles would also be located at least 50 feet away from creek channels. Wind erosion control to reduce wind speeds at the surfaces of soil stockpiles would be accomplished by erecting a windscreen or by changing the pile orientation or shape if covering piles is not practicable (i.e., when access to the pile is necessary).

At the completion of construction, the contractor would remove all construction debris and associated materials from the work site, staging areas would be smoothed and graded to conform to the natural appearance of the landscape, and graded areas would be hydroseeded. However, because hydroseeding would require several weeks to a year to become effective in halting soil erosion, particularly on steep slopes, exposed soils at staging areas could erode before the areas are re-vegetated. Therefore, Mitigation Measure 5.7.1 requires temporary sediment control devices such as soil stabilization fabrics to minimize erosion and to promote vegetation establishment. A detailed revegetation plan would be prepared to ensure that appropriate plant cover becomes established in disturbed areas.

In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout the duration of project construction at this site. Disturbed sites would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP

requirements. During the rainy season, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project. Treatment, including sedimentation or coagulation/flocculation (if necessary in NOA-containing areas), would be conducted to treat collected water prior to discharge. Implementation of these measures, which have been demonstrated to be effective at achieving Basin Plan water quality objectives and maintaining beneficial uses, would reduce the potential erosion and sedimentation impacts from construction staging areas to less-than-significant levels.

Borrow Area B

Borrow Area B is about 8 acres in area, is located on a steep slope, and would be excavated to a depth of approximately 200–280 feet. Rock and soil within Borrow Area B would be exposed during excavation, which would include blasting to provide rockfill for construction of the replacement dam. Loose exposed surfaces would drain directly from this area into Calaveras Creek, resulting in sediment discharges constituting a significant impact on the water quality of Calaveras Creek as well as downstream impacts on Alameda Creek.

Mitigation Measure 5.7.1 identifies BMPs to minimize erosion and sedimentation discharges into Calaveras and Alameda Creeks. BMPs relevant to Borrow Area B include turbidity control, diversion of runoff, protection of existing vegetation, sediment control, slope protection measures, wind erosion control, and measures to be conducted at the completion of construction. The contractor would install erosion and sediment control devices during construction, and temporary measures would be taken to stabilize disturbed soils on portions of the site that are not under active construction. Wind erosion control measures would also be implemented to contain fugitive dust that could be emitted from construction-related sources such as soil and debris piles and areas with destabilized soil, blasting activities, vehicle traffic on unpaved roads, and grading.

At the completion of construction, the contractor would remove all construction debris and associated materials from the work site. The final grade of the borrow area would be excavated with steep slopes, and the floor of the borrow area would be shaped for drainage. At the conclusion of construction, the borrow area would be contoured to drain and prevent rainwater from pooling. The site would be re-vegetated to the extent feasible; however, it would not be possible to fully re-vegetate and re-contour large cut slopes that contain exposed rock. A detailed re-vegetation plan would be prepared to ensure that appropriate plant cover becomes established in disturbed areas.

In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout the duration of project construction at Borrow Area B. This site would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements. During the portion of the rainy season that work is being conducted in Borrow Area B, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project. Implementation of Mitigation Measure 5.7.1, which includes BMPs that have been demonstrated to be effective at achieving Basin Plan water quality objectives and maintaining beneficial uses, would reduce the potential water quality impacts of excavation at Borrow Area B to less-than-significant levels.

Borrow Area E and Disposal Sites

The surface of Borrow Area E, located at the southern end of Calaveras Reservoir, would be exposed during excavation. Borrow Area E is about 85 acres in area, and approximately 840,000 cubic yards of material would be removed from this site for use in construction of the replacement dam. To decrease erosion potential during the wet season, excavation and fill

placement would not occur in Borrow Area E from mid-December to mid-March, unless conditions are determined to be suitable (i.e., dry). The SFPUC proposes to construct a drainage channel with check dams to prevent the discharge of sediment from this area to the reservoir. Borrow Area E would remain exposed for a minimum of approximately 7 months, after which a portion of it would potentially be used for Disposal Site 5. After project completion, the area would be submerged when the reservoir is refilled.

Four of the proposed disposal sites for earth materials from the dam would be located adjacent to Calaveras Reservoir. These sites are proposed to hold a combined total of approximately 3.835 million cubic yards of disposal material. Disposal Sites 2, 3, and 7 would contain approximately 470,000, 2.3 million, and 1.06 million cubic yards of material, respectively (SFPUC 2008, Table 6). In addition, Disposal Site 5, if needed, could contain up to 840,000 cubic yards. The total disposal area of Disposal Sites 2, 3, and 7 would be approximately 73 acres, and the disposal area of Disposal Site 5 would be 60 acres. Topsoil would be stripped from each of the disposal sites before waste material is deposited. Spoil material (consisting only of earth materials) would be compacted after being placed in the disposal sites; however, erosion of exposed earth material and stockpiled soil at the disposal sites could cause significant water quality impacts before the spoil material is compacted and the sites are re-vegetated and stabilized.

To reduce these potential impacts, Mitigation Measure 5.7.1 requires implementation of BMPs at Borrow Area E and disposal sites, including turbidity control, protection of existing vegetation, sediment control, slope protection measures, wind erosion control, and measures to be conducted at the completion of construction. In addition, Mitigation Measure 5.7.1 requires the preparation of a dewatering plan specifying how surface runoff and groundwater encountered during excavation would be managed to minimize erosion and sediment transport.

In accordance with Mitigation Measure 5.7.1, runoff from springs and seeps within the footprint of Disposal Site 3 would be collected and conveyed under the disposal site to the reservoir through sand and gravel finger drains. A small pond would be drained prior to grading for fill placement, and seepage from a spring located next to the east side of Disposal Site 7 would be conveyed to the toe of the fill through a drainage layer (URS 2008a, p. 10). As stated in Mitigation Measure 5.7.1, surface flow would be diverted around construction areas by diversion ditches, berms, or other structures. By using fiber rolls to reduce the effective slope length or berms/diversions at the top of slopes, runoff would be safely conveyed from the tops of slopes to minimize erosion potential from sheet flow.

Management, monitoring, and discharge of stormwater associated with construction activities would require an NPDES General Construction Activity Storm Water Permit from the RWQCB. Dewatering is expected to be necessary at Borrow Area E/Disposal Site 5, Disposal Site 3, and Disposal Site 7. Water produced during construction dewatering could contain sediments and

contaminants that could degrade water quality if the water were discharged directly to surface water or if it infiltrated to groundwater. Discharges into Calaveras Creek at Disposal Site 5 would need to meet Basin Plan standards set forth by the RWQCB before the water could be discharged to the creek. A portable treatment unit would be used, as needed, to comply with discharge requirements. Under normal conditions, non-stormwater discharges to receiving waters would be eliminated or reduced and monitoring would be conducted to ensure that all BMPs are implemented, maintained, and effective. However, the SFPUC has indicated that if an unusual storm event occurred during project construction, the combined volume of runoff and water produced from dewatering could exceed the capacity of the detention and treatment system, resulting in significant sedimentation reaching Alameda Creek or its tributaries. In accordance with Mitigation Measure 5.7.1, the RWQCB may determine through the permitting process, that to offset this sedimentation effect, the SFPUC should implement an off-site erosion control project or projects to offset impacts on water quality. Offset projects could include gully repairs, stream bank stabilization, slide repairs, or other actions acceptable to the RWQCB that would reduce or mitigate sources of sediment affecting Alameda Creek or its tributaries. Implementation of a dewatering plan, impoundment and treatment of water produced by construction site dewatering in a portable treatment unit, and offsets (if necessary) as required by Mitigation Measure 5.7.1, would ensure that the impacts of construction-related dewatering discharges on water quality would be less than significant.

For any discharge facilities affecting areas immediately adjacent to or within creeks and rivers, permits would be obtained from the USACE, CDFG, and RWQCB as applicable. The SFPUC would consult with and/or obtain approval from the U.S. Fish and Wildlife Service, CDFG, and/or National Marine Fisheries Service for any potential impacts on sensitive aquatic species or habitat. Implementation of Mitigation Measure 5.7.1 and compliance with the permitting requirements described above would ensure that construction-related discharge facilities would not degrade water quality or violate any water quality standards or waste discharge requirements.

Specifically at Disposal Site 3, a dike would be constructed at the down-slope end of the site to retard erosion of the edge of the fill at the existing water line. Material would be placed behind the dike and would fill the easterly side of the drainage. Construction of the dike would include excavation of approximately 10,000 cubic yards of material along the shore of the reservoir. In advance of excavation, a sheetpile wall or other control structure would be used to prevent sediment from migrating into the reservoir. During construction of the dike, turbidity would be monitored under the construction SWPPP, and additional controls would be implemented as necessary. Once the excavation has been completed, hard rock blueschist would be placed to form the dike. Materials disposed behind the dike and up to a minimum elevation of 760 feet would be compacted Temblor Sandstone; Franciscan Complex material that could contain NOA would not be placed in any area that would be in contact with water once the reservoir level is

restored. Blueschist rock that potentially contains metals (e.g., nickel) would be used to protect the foot of the fill.

Disposal Site 2 would be located in the space between the existing dam (which would serve as a cofferdam during construction) and the replacement dam. Rockfill from the upstream buttress of the existing dam would be re-graded over the fill surface between the two dams to reduce the potential for turbidity in the reservoir at times when the depth of water above the fill is shallow.

The material from Borrow Area E would be obtained through excavation; blasting would not be required. Because this area is located on the reservoir shoreline, a drainage channel with check dams would be used to prevent the discharge of sediment into the reservoir.

At the completion of construction, disposal sites would be contoured to blend into the existing topography and graded to have slopes no steeper than 3:1 (3 horizontal to 1 vertical). A detailed re-vegetation plan would be prepared to ensure that appropriate plant cover becomes established in disturbed areas that would remain above the inundation elevation.

Disposal Site 3 would rise to the northeast to a maximum elevation of 960 feet. Water from springs and seeps within the footprint of the disposal site would be collected and conveyed under the disposal site to the reservoir through constructed sand and gravel finger drains. The final grade of the site would be configured to allow re-vegetation and would approximate the contours of the adjacent hilly topography.

After the reservoir is refilled to an elevation of 756 feet, an inlet would be created at the bottom of the valley. The shoreline within the inlet at Disposal Site 3 would be restored and managed to encourage the re-establishment of riparian vegetation and transitional vegetation between riparian and upland areas. To minimize erosion, approximately 1,000 linear feet at the base of the east side of the disposal site would be protected by riprap. The remaining portion of Disposal Site 3, above 756 feet and outside of the riprap-covered area, would be restored by hydroseeding with a native grassland erosion-control seed mixture.

Water quality impacts from erosion and sediment discharge would be minimized through the proposed encapsulation, surface slope and drain design, and vegetation cover of all of the disposal sites. The project includes provisions for grading and drainage that optimize the restoration of the disposal sites. These provisions include rapid soil stabilization after disturbance of construction areas, minimization of soil placement or disturbance near the shoreline, and erosion and flow controls to dissipate velocities and drain water away from the disturbed areas.

After construction, Borrow Area E would be shaped to drain, as it would be submerged when the reservoir is refilled. If used for disposal, Disposal Site 5 (located within Borrow Area E) would

be under water after the reservoir level is restored to an elevation of 756 feet. The higher-lying parts of the site would be exposed above water during periods when the reservoir is drawn down.

In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout project use of Borrow Area E and the disposal sites. This project site would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements. During the rainy season, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project. Implementation of Mitigation Measure 5.7.1, which includes BMPs that have been demonstrated to be effective at achieving Basin Plan water quality objectives, would reduce the potential water quality impacts of the disposal sites and Borrow Area E to less-than-significant levels.

Haul Roads

Soil from haul roads has the potential to erode into surface waters. Approximately six roads would be constructed in the vicinity of the dam that would disturb a total of approximately 39.6 acres of land. If Haul Route Option 1 is implemented, an additional 3.4 miles of road would be constructed, resulting in an additional 35 acres of land being disturbed immediately adjacent to the shoreline of the reservoir. The substantial amount of heavy trucks using the road during construction would result in heavy abrasion of the gravel surface. The abraded materials would be loosened and readily erodible when subject to water and wind erosion. Abraded dirt surfaces often consist of fine particles. The west haul road would be located immediately adjacent to the reservoir and thus would constitute a notably high potential for sediment discharges into it. The ultimate receiving water for most abraded road material would be the reservoir itself. Haul Route Option 2 (barge across the reservoir) is discussed under Impact 4.7.3.

BMPs identified in Mitigation Measure 5.7.1 to minimize erosion and sediment discharges from haul roads include turbidity control, diversion of runoff, protection of existing vegetation, sediment control, slope protection measures, temporary stream crossings, wind erosion control, and measures to be conducted at the completion of construction.

The contractor would install erosion and sediment control devices during construction, and temporary measures would be taken to stabilize disturbed soils on portions of the site that are not under active construction. By using fiber rolls to reduce the effective slope length or berms/diversions at the top of slopes, runoff would be safely conveyed from the tops of slopes to minimize erosion potential from sheet flow. Wind erosion control measures would also be implemented, because fugitive dust could be emitted during construction and grading activities as well as by traffic.

As specified in Mitigation Measure 5.7.1, regular inspection of all haul road surfaces would be carried out by the construction contractor to ensure that a gravel surface cover is maintained in good condition throughout the construction period. Ruts, worn water bars and washed-out areas would be repaired immediately.

Haul Route 1 would cross several minor drainages, and culverts would be required at these drainage locations. Mitigation Measure 5.7.1 specifies that any temporary stream crossings would be constructed using a temporary bridge with gravel approach ramps or temporary culverts, backfilled with clean gravel/cobbles, and topped with a gravel road base. No earth and rockfill material would be placed in any stream channels. Temporary culvert/road crossings would be removed or stabilized upon completion of the project, with banks graded to a stable angle. At the completion of construction, the contractor would remove all construction debris and associated materials from the work site. Temporary haul roads would be smoothed and graded to the extent feasible in a manner to conform to the natural appearance of the landscape, and graded areas would be hydroseeded. The southern half of the west haul road would not be re-graded or hydroseeded following construction, as it would be mostly inundated when the reservoir is refilled to an elevation of 756 feet. However, cut slopes above 756 feet in elevation would be hydroseeded and stabilized. The northern half of the roadway would generally not be restored in areas where the road was excavated into rock.

Before temporary roads outside of the excavation areas are re-graded to their natural topography and hydroseeded for erosion control, exposed spoils could erode and become entrained in runoff into the creek, degrading water quality. Hydroseeding would require several weeks to a year to become effective in halting soil erosion, particularly on steep slopes. Sediment control devices such as soil stabilization fabrics would be used to minimize erosion and to promote vegetation establishment. A detailed re-vegetation plan would be prepared to ensure that appropriate plant cover becomes established in disturbed areas.

It would be necessary to fill several small drainage arms of the reservoir to straighten the west haul route. Culverts would be installed under these fills to maintain normal drainage. Fill would be removed from the small drainage arms after construction of the dam is completed. In addition, the road would be constructed so that it slopes away from Calaveras Reservoir to a collection ditch on the inside margin of the road, which would allow point-source treatment of stormwater runoff from the road to collect silt and oil before the water enters the reservoir.

At the completion of construction, the contractor would remove all construction debris and associated materials from the work site. Restoration activities for the west haul road would vary depending on the location. Gravel surfacing would remain on all portions of the roadway. Portions of the road below 756 feet in elevation would be inundated, and all fill and culverts would be removed from drainages. The fire road above 756 feet would be re-graded. In accordance with Mitigation Measure 5.7.1, the restored areas would be covered with topsoil and hydroseeded.

The northern half of the roadway would generally not be restored in areas where the road was excavated into rock. Restoration by refilling the cuts is not proposed because compacted fills on the steep slopes would be more likely to erode than the rock cuts, and thus would have a greater potential to degrade water quality. The gravel surfacing on the roadways would also be left in place in these areas. The portion of the haul road in the vicinity of the existing boat ramp would be constructed similarly to the southern half of the haul road and would be re-graded, covered with topsoil, and hydroseeded (URS 2008b, p. 2). All fill and culverts would also be removed from drainages in the northern half and placed in Disposal Site 3.

The section of the haul road from Disposal Site 3 to the existing spillway across the Disposal Site 3 access area would be left in place because this area would be excavated into rock; if compacted fill were applied to the steep slopes in an effort to restore the original grade, the area would be more likely to erode and degrade water quality. In addition, portions of the road in this section, from about 695–772 feet in elevation, would be armored with riprap to protect the serpentine bedrock exposed in this area from erosion.

Off-Site Haul Roads

Dust from off-site fill materials transport to the project site could be deposited on roads and adjacent areas and, when subjected to wind or rainfall runoff, could result in sediment discharges into Alameda Creek and impair the associated beneficial uses. The importation of off-site materials for dam construction would start in 2011 and again in early 2013. Although the source of off-site sand and gravel is not yet known and would be chosen by the contractor, these materials would be transported to the project site by way of Calaveras Road. For trucks leaving the project site, Mitigation Measure 5.7.1 includes BMPs to minimize the potential for tracking mud and dirt out of the project area and includes a BMP for maintaining access roads throughout

the construction period. Trucks leaving the quarries would be subject to Air Quality Mitigation Measure 5.13.1a, which states that all trucks hauling soil, sand, and other loose materials must be covered or would be required to maintain at least 2 feet of freeboard. Depending on the quarry chosen to supply off-site fill materials, quarry operating conditions would likely include requirements regarding truck washing and road sweeping to control dust and sedimentation. This mitigation measure, along with existing quarry operating permit conditions, would control dust and would reduce potential water quality impacts related to the transportation of off-site fill materials to less-than-significant levels.

ACDD Bypass Facility

Construction of the bypass facility at the ACDD would involve tunneling approximately 20 feet using concrete core-drilling equipment. A 0.25-acre staging area would be established adjacent to the north side of the dam spillway, which would include a temporary containment berm. A temporary work containment area used to drill the tunnel would be located on the downstream side of the ACDD. Installation of the ACDD bypass facility is expected to take approximately 2 to 3 weeks and would occur in a low-flow period (summer) when the Alameda Creek bed would likely be dry. Construction activities within the stream channel would require permits from the USACE, RWQCB, and CDFG. Installation of the ACDD bypass facility would include minimal soil disruption and would be conducted primarily within a containment area, and it is likely that Alameda Creek would be dry during construction. The construction contractor would remove any unnatural materials from the site. Therefore, water quality impacts related to soil erosion and sediment discharge are considered less than significant.

Impact Conclusion

Given the massive scale of the proposed excavation and spoils hauling and disposal and year-round construction schedule, erosion and sediment discharges during project construction could violate water quality standards and otherwise substantially degrade water quality. As such, the proposed project could have a significant impact on water quality.

In accordance with Mitigation Measure 5.7.1, site-specific BMPs would be implemented to avoid or minimize water quality impacts from the erosion and transport of sediment, meet Basin Plan water quality objectives, and protect beneficial uses. The implementation of BMPs would occur before construction activity is initiated at a given site. The BMPs would include measures such as installing silt fences, directing runoff into constructed settling basins, covering stockpiled soils, and locating stockpiled soils away from drainage areas. Silt fences intercept and detain sediment while decreasing the velocity of sheet flow runoff, allowing particles to settle and preventing them from entering water bodies (CASQA 2003).

Settling basins collect and hold runoff to allow suspended sediment to settle out. Settling basins would be used in conjunction with other measures to control runoff, erosion, and sediment discharges. Each settling basin would be cleaned before it is full to restore its original design volume, and would remain in place until the disturbed area is permanently stabilized. Under normal conditions, non-stormwater discharges to receiving waters would be eliminated or reduced. However, the SFPUC has indicated that if an unusual storm event occurred during project construction, the combined volume of runoff and water produced from dewatering could exceed the capacity of the detention and treatment system, resulting in significant sedimentation reaching Alameda Creek or its tributaries. In accordance with Mitigation Measure 5.7.1, the RWQCB may determine through the permitting process, that to offset this sedimentation effect, the SFPUC should implement an off-site erosion control project or projects to offset impacts on water quality. Offset projects could include gully repairs, stream bank stabilization, slide repairs, or other actions acceptable to the RWQCB that would reduce or mitigate sources of sediment affecting Alameda Creek or its tributaries. Implementation of a dewatering plan, impoundment and treatment of water produced by construction site dewatering in a portable treatment unit, and offsets (if necessary) as required by Mitigation Measure 5.7.1, would ensure that the impacts of construction-related dewatering discharges on water quality would be less than significant.

Mitigation Measure 5.7.1 also specifies that after excavation of any open cut slope, slope protection measures (such as fiber rolls, drainage ditches, or erosion control fabrics) would be installed to minimize the potential for erosion. Soil stabilization fabrics would be used in areas where erosion is high, such as short, steep slopes and areas where plant growth is too slow to provide protective cover. Soil stabilization fabrics might also be used on slopes when immediate protection is required, such as just prior to the rainy season. Erosion control methods would be used to prevent and reduce erosion and to decrease the need for sediment controls to capture and contain loose sediment. A combination of erosion and sediment controls would be used in all disturbed areas to keep sediment from entering Calaveras and Alameda Creeks.

As construction activities in this area would occur year-round, Mitigation Measure 5.7.1 also requires BMPs to be installed at the appropriate time to control erosion and sediment (e.g., silt fences, detention basins, etc. would be installed prior to October 15, the start of the rainy season). During severe winter or spring storms, additional BMPs (e.g., placing more straw bales and silt fences, pumping out detention basin water as near-capacity is reached) could be required to ensure that large volumes of runoff are controlled. Construction activity might have to stop temporarily until stormwater runoff subsides. Mitigation Measure 5.7.1 also states that excavation and the placement of fill in Borrow Area E would be restricted to the period from mid-March through mid-December unless conditions are suitable (i.e., dry).

Upon project completion at a given construction site, the construction contractor would return the project site to a stable condition, including re-grading the site and re-vegetating disturbed areas.

BMPs would continue to be maintained until the soil is stabilized and the erosion hazard is minimized. Drainage and runoff water from any part of the project site that could become turbid with eroded soil would be collected and settled out in a detention basin or treated to reduce the turbidity to acceptable levels before the water is discharged to natural drainage channels.

Specific locations and time periods for these discharge controls have not yet been determined. However, pursuant to the NPDES Construction General Permit and Mitigation Measure 5.7.1, the specific locations, timing, and phasing of BMPs would be identified in the SWPPP.

Mitigation Measure 5.7.1 requires inspection, maintenance, and adjustments of BMPs as needed to ensure that they perform effectively. In accordance with Mitigation Measure 5.7.1, the SWPPP would require inspection and maintenance of the BMPs throughout the duration of project construction at this site. Disturbed sites would be inspected in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements. During the rainy season, all erosion and sediment control measures would be inspected at least weekly and, after the first storm of record, all measures would be inspected daily during and after each storm event. Breaches of erosion and sediment control measures would be repaired at the close of each day whenever rain is forecasted. Corrective action and reporting of erosion and sediment control measures that are not meeting their installation specifications would be undertaken immediately. The SFPUC or its contractors would maintain ample stockpiles of site-specific devices such as silt fencing and straw-waddles to enable immediate repair or replacement of failed BMPs.

Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would provide site-specific monitoring methods. If monitoring indicates elevated levels of turbidity, treatment would be imposed to ensure levels are within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project.

Implementation of Mitigation Measure 5.7.1, which includes BMPs that have been demonstrated to be effective at achieving Basin Plan water quality objectives and maintaining beneficial uses, would reduce construction-related water quality impacts related to erosion and sediment discharges to a less-than-significant level.

Impact 4.7.2: Impact on water bodies as a result of a hazardous materials release, NOA or metals release, or solid waste discharge during construction.

Releases of hazardous materials, NOA, or metals or discharges of other contaminants could be detrimental to water quality. The impact of construction related NOA and metal discharges into

receiving waters are discussed first, followed by a discussion of impacts from incidental contaminant spills, and finally followed by a discussion of solid waste (debris, trash and litter) impacts.

NOA and Metals Impacts

Sources of NOA and Metals

Construction in Franciscan Complex *mélange* (NOA-containing rocks) at the dam site and nearby areas could encounter veins of serpentinite and ultramafic rocks. Serpentinite and ultramafic rocks, as well as Franciscan *mélange*, can contain a form of NOA and potentially enriched concentrations of select metals (see Section 4.9, Hazards and Hazardous Materials). Serpentine rock from Franciscan *mélange* at the site is known to contain chrysotile and amphibole asbestos. Those forms of asbestos may present a human health hazard if they become airborne. Field testing evaluations of native rock and dam fill materials at the project site performed in 2008 indicate that NOA is found in Franciscan Complex serpentinite and *mélange* rock materials as well as colluvium, alluvium, topsoil, and fill derived from these rock types for construction of the dam, spillway, Borrow Area B, Disposal Areas 3 and 7, the stilling basin, tunnel and adits, and access roads as well as removal of the upper portion of the existing dam where some of the fill materials were obtained from serpentinite and *mélange* as described in Subsection 4.7.1, Setting (URS 2009, p. 4-1). Elevated concentrations of asbestos are primarily a concern in regard to the airborne pathway of dispersal and exposure to humans, and that analysis is presented in Section 4.9, Hazards and Hazardous Materials. Dispersal and exposure of asbestos via a waterborne pathway presents substantially reduced risk to human health, as is discussed below.

Excavation at borrow sites with Franciscan *mélange* or with alluvium and colluvium containing asbestos materials could encounter asbestos. Likewise, excavation of the existing dam materials in the core could encounter materials containing NOA, as local rock material was used in the dam's original construction and some of that rock included asbestos-containing Franciscan *mélange*.

Heavy metals are contained with ultramafic rocks within the Franciscan *mélange* in the project construction area. These metals include chromium, nickel, arsenic, copper and cobalt (URS 2009, p. 2-3) which may present a health risk to humans and to the environment if present in excess and if exposure occurs over a long period of time. In general, the metals concentrations at the site were highest in samples of serpentinite and top soil, and lowest in samples of Temblor Sandstone, greywacke, fill without NOA, and Borrow Area E alluvium (URS 2009). The water chemistry of the system controls the rate of metal leaching from the asbestos rich sediments. Metals may be leached from the sediment if the water experiences a decrease in pH below 8.0. Water quality objectives for metals included in the Basin Plan are summarized in Table 4.7.9.

Table 4.7.9: Basin Plan Water Quality Objectives for Metals

Compound	Water Quality Objective	
	4-Day Average (µg/L)	1-Hour Average (µg/L)
Arsenic	150	340
Chromium VI (may be met as total chromium)	11	16
Copper	9.0	13
Nickel	52	470
<i>Note:</i> µg/L = micrograms per liter.		

Source: RWQCB 2006, Table 3-4

Pathways for Dispersal into Water Bodies

Blasting, excavation, transport, and stockpiling of serpentinite and ultramafic rock materials could result in the airborne dispersal of materials containing asbestos and metals and subsequent deposition in water bodies as well as entrainment of the particles in runoff discharged into Calaveras Creek and Calaveras Reservoir. Blasting activities would take place during excavation of the dam foundation, during excavation of the spillway, and at Borrow Area B and would create widely dispersed materials over a broad area with the potential of deposition into either Calaveras Reservoir or Calaveras Creek. Foundation excavation would be contained within smaller work areas at any one time; however, the close proximity of these construction activities to the reservoir would increase opportunities for NOA and metals to enter reservoir waters. Excavation activities would also occur in alluvium directly adjacent to Calaveras Creek with a direct route for discharge into the creek. In addition, transportation of NOA-containing materials on project roadways has the potential for spillage along the narrow road corridor to the disposal site. These materials could enter Calaveras Reservoir; however, quantities of spilled materials would be expected to be small. Stockpiles, if not properly located, covered, and protected, could discharge NOA-containing materials either via wind or water erosion into water bodies, which would result in localized deposition.

Erosion of soils containing NOA and metals could be carried in surface runoff and discharged into waterways, notably Calaveras Creek; the Franciscan Complex mélange rocks form steep valley slopes on the west side of the creek. Cuts into these slopes, as previously described, could generate erosion of the remaining soils and exposed roughened rock surfaces. The amounts and rates of releases of these natural hazardous substances cannot be quantified based on the information available at this time; however, it would be expected that elevated concentrations of NOA and metals would be found near the exposure site at the time of construction and these concentrations would attenuate in the water body with both time and distance. During times of higher precipitation, which typically occur in the winter months between approximately

November and April, water-induced erosion would be expected to increase the amount of NOA and metals entering waterways; however, during the high precipitation events, associated high flows would serve to dilute and disperse NOA and metals as the plume moves away from the site of earth-working and transportation activities. In general, roughened rock surfaces would undergo weathering over time, and thus the releases of NOA and metals would likely be at their highest after initial exposure and then gradually diminish over time, returning to background levels similar to those that exist at present.

The prevention of airborne dust that potentially contains NOA and metals is addressed in Section 4.9, Hazards and Hazardous Materials. Mitigation Measure 5.9.2a would require a Dust Mitigation Plan, which includes Airborne Toxic Control Measures (ATCMs) to prevent the generation of airborne particulate matter. ATCMs can include dust control measures such as surface watering, using tackifiers, and/or applying amended water sprays before blasting and excavation activities in areas of reduced access to prevent airborne particles from becoming fugitive. Runoff of the water used for dust control could transport NOA and metals into surface waters.

Potential water quality impacts from project construction would be mitigated through the implementation of a SWPPP that contains, at a minimum, the project-specific BMPs set forth in Mitigation Measure 5.7.1. In accordance with Mitigation Measure 5.7.1, the SWPPP would incorporate a dust mitigation plan outlining detailed dust control measures for areas containing NOA and metals. The quantity of runoff water would be minimized in accordance with Mitigation Measure 5.7.1. Water application rates would be controlled to prevent runoff and ponding, and leaks from water trucks and equipment would be repaired immediately. Excess water generated during the implementation of dust control measures and on-site equipment washing would be controlled, monitored, and treated as necessary prior to discharge to a receiving water body. Advanced treatment including coagulation/flocculation (if necessary), sedimentation, and filtration would be used.

Equipment used in NOA-containing areas would be washed on site with water and brushes or a wheel wash system prior to moving the equipment to non-NOA-containing areas, as required in the dust mitigation plan. Wheel wash systems would use water without solvents. Treatment of collected water in NOA-containing areas would include coagulation/flocculation (if necessary), sedimentation, and filtration. Implementation of Mitigation Measure 5.7.1, which consists of BMPs that are commonly used on projects and have been demonstrated to be effective, would reduce the impact to a less-than-significant level. As requirements under a SWPPP, BMP implementation, maintenance, and performance are enforceable, as the BMPs are part of a regulatory program that applies penalties if the program goals are not satisfactorily achieved.

Concentrations and Their Durations in Alameda Creek and the Reservoir

The largest concentrations of NOA and metals would be eroded and dispersed into the air and water during active project construction. During these times, elevated concentrations of NOA and metals would be expected near the exposure sites. NOA and metals that enter Calaveras Reservoir would be dispersed into the water body and would settle out quickly and collect at the bottom of the reservoir near the discharge point. Concentrations of NOA and metals would be initially high, and would then taper off as equilibrium is established in the source area. NOA and metals that enter Calaveras Creek would be conveyed downstream and would be diluted with time and distance from the initial discharge point. NOA and metals would enter waterways as plumes if discharged during a large storm event or in the case of a concentrated discharge resulting from a failed BMP. Following the completion of construction as permanent vegetation is being established and roughened surfaces undergo weathering, slow discharge of NOA and metals would be expected that would gradually diminish over time, returning to background levels similar to those that exist at present. NOA and metals would be diluted within the reservoir and creeks.

Impacts related to NOA and metals in Alameda Creek and Calaveras Reservoir would be minimized through implementation of a SWPPP and the associated use of BMPs as set forth in Mitigation Measure 5.7.1. Preservation of existing vegetation where possible, development of a wet-weather contingency plan stating which BMPs will be used, and use of erosion and sediment controls such as straw-waddles, coir logs, sediment fences would be installed to prevent soil and any associated NOA and metals from entering waterways. Slope protection such as use of fiber rolls, drainage ditches, or erosion control fabrics would minimize the potential for concentrated surface runoff to cause erosion and transport materials containing NOA and metals into the reservoir or creeks.

Mitigation Measure 5.7.1 includes requirements to treat all elevated levels of asbestos and metals on site to bring them within established water quality standards (if applicable) in force at the time of occurrence. For NOA-containing areas, treatment may include coagulation/flocculation (if necessary), sedimentation, and filtration. Equipment used in NOA-containing areas would be washed with water and brushes or a wheel wash system prior to entering non-NOA-containing areas, as required in the dust mitigation plan to minimize the dispersion of NOA and metals. In addition, in the event of a release of NOA or metals in any waterways in the Alameda Creek system, the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD would be notified.

Impacts on Beneficial Uses (Exposures to Humans and Aquatic Biota)

Releases of NOA would not exceed Basin Plan water quality objectives, as there is no Basin Plan water quality objective for asbestos. However, Basin Plan standards exist for several of the

metals that may be present in the serpentine rock, including arsenic, copper, chromium, and nickel (Table 4.7.9). Releases of NOA and metals could affect beneficial uses including aquatic habitat in Calaveras Reservoir or Alameda Creek and recreation in Alameda Creek. However, releases into Calaveras Reservoir would not affect municipal and domestic water supply, as reservoir water is treated at the SVWTP prior to use. Treatment processes at SVWTP include coagulation, flocculation, sedimentation, filtration, and disinfection, which would remove or substantially reduce concentrations of asbestos and metals in drinking water to required levels. Furthermore, any elevated concentrations of asbestos or metals in raw water prior to treatment would be expected to be short-term in duration during construction. In general, health concerns related to asbestos and metals in drinking water are related to chronic exposure over extended periods of time. Asbestos exposure in drinking water is not known to cause health problems with short-term exposure (USEPA 2006; Wigle 1977).

Exposure effects of asbestos on both humans and animals through ingestion have not been investigated in detail; however, Toft and Meek (1983) concluded based on a review of the toxicologic studies on ingested asbestos that there is no conclusive evidence that it is carcinogenic or cocarcinogenic in animal species. There is some evidence that asbestos fibers are potentially an irritant to fish (Schreier et al. 1987). Schreier et al. (1987) reported that fish exposed to high NOA concentrations uptake trace metals released from the NOA fiber structure. The fish were recorded as having significant levels of nickel in whole fish samples. Other than the elevated levels of metals that were observed, no other abnormalities in the fish were observed and the fish did not show any evidence of unusual growth. Metals concentrations were found to differ between fish species. With implementation of Mitigation Measure 5.7.1, as previously described, release of NOA and metals into waterways would be minimized. In addition, exposure to NOA and metals in the creeks and Calaveras Reservoir would be short-term, as concentrations would attenuate over time.

There would be no impacts on water contact and non-contact water recreation in Calaveras Reservoir during construction, as water contact recreation, boating, and fishing are not currently allowed in the reservoir. However, body contact recreation in Alameda Creek could result in exposure to NOA and metals. The highest flows in Alameda Creek downstream of the dam occur during the winter months when body-contact recreation use would be anticipated to be low. During times when body contact recreation may occur in Alameda Creek, the quantity of ingestion of water would be minimal and exposure would be short-term. In addition, the dilution and dispersion of NOA and metals concentrations over time would cause a net decrease in contaminant levels at any one location. Attenuation of NOA and metals over time would depend upon the velocity of the particular water and the rate of mixing. As the potential health concerns relating to contact with NOA and metals are related to chronic exposure over long periods of time, exposure to recreationists would be minimal and would not pose a significant health risk.

Conclusion

Releases of NOA to surface waters would not be anticipated to affect beneficial uses substantially and are considered less than significant. However, NOA-bearing materials may also contain metals for which there are Basin Plan objectives. There is a high degree of uncertainty about the extent to which these metals could become mobilized and enter the water column. There is additional substantial uncertainty about metals concentrations and dispersal in the reservoir and creek system. This evaluation conservatively assumes that there is some chance that these could affect beneficial uses in the short-term and develops mitigation to minimize this potential impact accordingly. With the implementation of Mitigation Measure 5.7.1, impacts on water quality related to the release of metals would be less than significant.

As a result of construction activities, NOA and metals could be deposited by air or water in Calaveras Reservoir and subsequently transported to the SVWTP via the Calaveras Pipeline where treatment would remove them or reduce them to required Drinking Water Act standards, and therefore the potential impact would be less than significant.

Spills and Release of Accumulated Contaminants

Accidental spills of construction-related substances such as oils and fuels could contaminate both surface water and groundwater (see Impact 4.9.6 in Section 4.9, Hazards and Hazardous Materials). The extent of potential water quality effects would depend on the following factors: the types of construction practices, the timing of particular construction activities in relation to the rainy season, the proximity of construction equipment to receiving water bodies, and the sensitivity of those water bodies to contaminants of concern. Contaminants that enter receiving waters through stormwater runoff could introduce compounds that are toxic to aquatic organisms.

The discharge into water bodies of hazardous substances used in construction could result in contaminant levels that exceed Basin Plan water quality objectives and affect beneficial uses. Impacts could result from accidental spills of contaminants, discharges of contaminants that could collect and gradually build up on roads and construction sites, and discharges of contaminants resulting from dewatering. Each of these potential sources is discussed below, in addition to debris and trash impacts on water bodies.

Construction activities would have the potential to discharge construction wastes into project area waters. Such activities include refueling construction equipment, operating vehicles, performing equipment maintenance and repair, temporarily storing diesel fuel, and handling other construction materials such as concrete, grout and slurry (and their constituent materials), and solvents. Each activity has the potential to temporarily impair water quality in either Calaveras Reservoir or Calaveras and Alameda Creeks over the construction period of approximately 4 years (from 2011 through 2014) due to the inadvertent discharge of petroleum products and other

construction-related wastes (e.g., concrete, oil, solvents) into receiving waters. Impacts of the barging option on water quality are discussed in Impact 4.7.3.

During construction of the spillway and stilling basin, shotcrete, concrete, and their constituent chemicals could be discharged into the creek during placement of the shotcrete and construction of the cement spillway and stilling basin. Such materials could temporarily increase turbidity and alter the pH and water chemistry. Slurry used for construction is usually composed of cement, bentonite, and water. This mixture has the consistency of liquid mud when it is placed during construction. Grout, a mixture of cement and water, would be used beneath the core of the dam and would be injected under pressure into open fractures within the rock foundation. Improper handling or storage could result in releases to nearby surface water, thereby degrading water quality with very fine clay that could be suspended and transported in creeks in turbidity plumes.

Drilling could result in an inadvertent release of drilling fluid or a “frac-out,” a phenomenon in which the pressurized drill fluid travels upward through the substrate and is released to the ground surface or water column. Such a release could smother habitat and increase turbidity and suspended sediments in the water column. The tunnels excavated in rock for the extensions of the adits and to accommodate a new pipeline connecting the new intake shaft to the existing outlet pipeline could be subject to frac-out if drilling fluids are used. Given that the tunneling would not be conducted under an actively flowing creek and that the tunnel would be excavated in rock to a depth of 163 feet, it is unlikely that drilling fluids, even if they travel through the substrate, would result in a frac-out at the ground surface or bottom of Calaveras Creek. While unlikely, should frac-out occur it nevertheless would be a potentially significant impact on water quality and/or groundwater quality. If this technique is used, implementation of Mitigation Measure 5.7.2, which requires appropriate management of drilling fluids, would reduce this potential impact to a less-than-significant level.

The ACDD bypass facility would be constructed in concrete and would not use drilling muds. However, containment, collection, and proper disposal of drilling waste would be necessary due to the need to stage the majority of operations on the downstream side of the gravity wall and within the stream channel (URS 2008b). All drilling and construction waste would be contained and transported off site for disposal. Construction would be staged on the downstream concrete apron as much as possible, and the staging area would include a temporary containment berm to retain any spills of diesel fuel or other construction materials. The containment area would include facilities for the storage and containment of drilling waste (disposal would be off site). In accordance with Mitigation Measure 5.7.1, project-specific BMPs would be implemented to reduce impacts from contaminants that could be discharged into Alameda Creek. Materials handling, storage, and spill response practices would be implemented to reduce the possibility of adverse impacts from the use or accidental spills or releases of contaminants.

Excavated areas that fill with groundwater or surface drainage during project construction would require dewatering. Dewatering wells, well point systems, and seepage collection trenches would be used to collect and control seepage into the foundation area and at the downstream toe of the existing dam. Water produced during construction dewatering could contain sediment and potentially contaminants that could degrade water quality if the water were discharged directly to surface water (e.g., increase turbidity, alter pH, add harmful chemicals and change water temperature). Impacts related to the infiltration to groundwater of water produced during construction dewatering are discussed in Impact 4.7.7. The discharge of such water could exceed Basin Plan objectives, resulting in a significant impact on water quality.

In accordance with Mitigation Measure 5.7.1, the SWPPP would include a dewatering plan designed to address potential water quality impacts from construction site dewatering. Mitigation Measure 5.7.1 specifies that water produced during dewatering would be impounded and treated to comply with Basin Plan standards prior to discharge to receiving waters. However, the SFPUC has indicated that if a 10-year or greater storm event occurred during project construction, the combined volume of runoff and water produced from dewatering could exceed the capacity of the detention and treatment system, resulting in the discharge of untreated water. The main concern in this circumstance would be turbidity because dilution of the other water quality parameters would substantially diminish their effect in a large storm. In contrast, in a large storm natural turbidity would already be high, such that the addition of construction-related sediments would cumulatively increase the turbidity above the natural level. Water discharged under such circumstances would not be expected to exceed Basin Plan water quality objectives for constituents such as oil, grease, or other toxic pollutants.

In accordance with Mitigation Measure 5.7.1, BMPs for hazardous materials control, equipment washing, and material delivery and storage, described below, would control contaminants and minimize the quantity of contaminants available to affect water quality. During large storm events, the amount of contamination that would enter project waterways without treatment is expected to be low. Implementation of the dewatering plan, impoundment and treatment of water produced by construction site dewatering (as required by Mitigation Measure 5.7.1), implementation of hazardous materials BMPs, would ensure that the impacts of construction-related dewatering discharges on water quality would be less than significant.

In accordance with Mitigation Measure 5.7.1, the SFPUC or its contractor(s) would submit the required notices, develop a SWPPP, and implement site-specific BMPs in accordance with the SWPPP to control and reduce discharges of pollutants associated with construction stormwater runoff into any receiving waters. These practices would include provisions to develop and implement strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways. The SWPPP would also require prevention of discharge of raw cement; concrete or concrete washings; asphalt, paint, or other coating material; oil or other

petroleum products; or any other substances that could be hazardous to aquatic life by contaminating the soil or entering watercourses.

The SWPPP would also include protection measures for the temporary on-site storage of diesel fuels used during construction, including requirements for secondary containment of the diesel storage area or any chemical storage areas. Secondary containment would contain a potential release and prevent any such release from reaching an adjacent waterway or stormwater collection system. Non-stormwater discharges to receiving waters would be eliminated or reduced, and monitoring would be conducted to ensure that all BMPs are implemented, maintained, and effective. The control measures would also be consistent with the appropriate local guidelines for stormwater control and policies and actions of the SFPUC's *Alameda Watershed Management Plan*, including:

- Policy WQ5. Minimize the risk of metals leaching to water bodies and prohibit dumping of metals within the watershed.
- Policy WQ6. Prevent the introduction of asbestos fibers into the water supply.
- Policy WQ7. Prevent the potential for hazardous materials spills into the water supply by controlling their use and transport within the watershed.
- Action haz1 (Phase 1). Develop hazardous chemical management procedures addressing the type, use, storage, transport, and disposal of hazardous chemicals and pesticides used in watershed activities (e.g., SFPUC operations, nurseries, quarries, pest management, easements and leases, etc.). Guidelines include:
 - A. Ensure proper material transport procedures (e.g., tie-down/attach material to vehicle).
 - B. Carry appropriate spill response chemicals when transporting hazardous chemicals and pesticides.
- Action haz8 (Phase 1). Train staff members, as appropriate, in spill response and containment measures for SFPUC vehicles as well as for other types of spills on the watershed.

In accordance with Mitigation Measure 5.7.1, project-specific BMPs to reduce impacts from contaminants that could be discharged into Calaveras Reservoir, Calaveras Creek, and Alameda Creek include control of hazardous materials, equipment maintenance, equipment washing, and material delivery and storage. Control of hazardous materials would be implemented at laydown and staging areas, for barge material transport, at the dam construction area, and at the right-abutment landslide area. With the implementation of these measures, potential impacts on water quality within the reservoir and Calaveras and Alameda Creeks due to the release of hazardous materials during construction would be less than significant.

Debris, Trash, and Litter Impacts

In addition to chemical contaminants, construction debris, trash, litter, and waste (e.g., packing material, tape, plastic bags, paper, cans, bottles, cigarette butts, containers for fuels and solvents, and assorted loose debris) could also enter the water, diminishing water quality in Calaveras Reservoir, Calaveras Creek, and Alameda Creek. Some discarded waste materials (e.g., discarded containers for fuels and solvents) might be toxic or hazardous. Other construction debris, waste, and litter, while not specifically toxic, would diminish aquatic habitat quality, pose life-threatening hazards to or injure wildlife, and degrade water quality and stream aesthetics. To prevent potential water quality impacts from improper disposal of construction debris and trash, Mitigation Measure 5.7.1 requires proper management and disposal of construction materials, debris, and trash and stipulates removal from the site of any such materials that remain at the conclusion of construction. Implementation of these requirements would ensure that the potential water quality impacts from construction debris and trash are less than significant.

Impact Conclusion

Construction activities would generate numerous sources of contaminants such as fuels, lubricants, and other chemicals; cement/shotcrete (and their constituent materials) drilling muds and cuttings; and trash and debris that could be discharged from diverse points and nonpoint-source areas into Calaveras Reservoir, Calaveras Creek, and Alameda Creek. NOA and metals could also be discharged into Calaveras Reservoir or Calaveras Creek and downstream in Alameda Creek during construction. There is uncertainty about the degree to which these contaminants could be mobilized and enter the water column. There is no Basin Plan objective for asbestos, but there are objectives for some of the metals that may be present. These are not anticipated to affect the Municipal and Domestic Water Supply beneficial uses because water is treated at SVWTP prior to use. However, this analysis conservatively assumes that these contaminants potentially could affect aquatic beneficial uses. As such, the proposed project could have a significant impact on water quality due to the release or discharge of hazardous materials, construction debris, trash, NOA, and metals during construction.

Implementation of Mitigation Measures 5.7.1 and 5.7.2 would reduce the potential impacts on water quality due to the release of hazardous materials, construction debris, trash, NOA, and metals during construction to less-than-significant levels. Treatment of Calaveras Reservoir raw water at the SVWTP would ensure that impacts on drinking water quality are less than significant. BMPs identified in Mitigation Measure 5.7.1 could feasibly mitigate potential impacts on water quality during construction of the replacement dam, as these BMPs are accepted practices that have been successful in the past at achieving Basin Plan water quality objectives. As requirements under a SWPPP, BMP implementation, maintenance, and performance are

enforceable, as the BMPs are part of a regulatory program that applies penalties if the program goals are not satisfactorily achieved.

Impact 4.7.3: Impact on water bodies as a result of erosion and sediment discharge or a hazardous materials release associated with construction of barge docking facilities and during barging operation.

Haul Route Option 2 would involve using barges to transport borrow material about 2.6 miles across the reservoir from Borrow Area E to the replacement dam construction site. Barging activities have the potential to affect beneficial uses in Calaveras Reservoir, including fish habitat. Impacts on municipal and domestic water supply are considered less than significant, as reservoir water is treated at the SVWTP prior to use. The SFPUC does not foresee a system water quality issue due to barge operations. In addition, impacts related to water contact and non-contact water recreation during construction would not occur, as water contact recreation, boating, and fishing are not allowed on the reservoir. However, barging activities could increase turbidity and temperature, reduce DO levels, and possibly release hazardous materials into the reservoir through accidental spills, which could be detrimental to aquatic species.

Construction would require approximately 1 month for mobilization, 8 months of barging, and 1 month for demobilization of facilities. This option would require the construction of temporary docking facilities, consisting of rockfill jetties, at the north and south ends of the reservoir to load material onto and off of the barges. The jetty at the southern end of the reservoir (about 12,000 cubic yards) could be up to 1,000 feet long and 50 feet wide at the base. Either a floating dock or two rockfill jetties (6,000 cubic yards each) would be constructed at the north end of the reservoir along the shoreline. These jetties could be up to 500 feet long and 50 feet wide at the base. Construction of the jetties would involve construction activities that require the use of machinery, equipment, and workers in Calaveras Reservoir. If a floating dock is used, pile driving would be required to establish anchoring locations for barges during loading and unloading, causing plumes of suspended sediment and an increase in local turbidity. Barges would be loaded and unloaded using excavators, conveyors, or loaders working from the jetties. The approximate disturbed area for construction of the loading docks would be 2.5 acres.

Constructing the loading docks, loading and unloading the barges, and transporting the materials on the barges across Calaveras Reservoir could temporarily impair water quality in the reservoir. Pile driving would create strong vibrations in and displace bottom sediments, and thereby generate in-reservoir sediment turbidity plumes. Access lanes for the barges might need to be dredged, and maintenance dredging could also be required, particularly on the shallow southern end of the reservoir. Such dredging likely would generate the most substantial turbidity plumes but would be of temporary duration. As set forth in Mitigation Measure 5.7.1, the use of suction dredgers instead of clamshell dredging machinery would be required, as suction dredgers would likely reduce the amount of disturbance and size of turbidity plumes. However, the amount of

turbidity generated by dredging would remain significant. The potential effects of increased turbidity on aquatic habitats would be significant (see Impact 4.5.4 in Section 4.5, Fisheries and Aquatic Habitat).

Barge tugboat motors would stir up sediment in shallow waters and similarly create turbidity plumes. Waves generated by barge wakes could also cause erosion of exposed shores of Calaveras Reservoir, particularly in exposed, soft, saturated soils. Tugboat operations would be a repeated daily occurrence throughout much of the construction period; thus, the impacts on water quality would occur over an extended period. Fine material in the turbidity plumes would slowly settle out, but each operation could renew disturbance.

The effects of Haul Route Option 2 identified above could have potentially significant impacts on the water quality of Calaveras Reservoir. To reduce these potential impacts, Mitigation Measure 5.7.1 requires that barge and tugboat speeds and no-wake zones be established and enforced to decrease erosion energy and turbidity. During barging operations, all materials would be secured on the barge to prevent discharges to Calaveras Reservoir via wind, and sideboards would also be used to confine clay materials on the barge. Steel decking would be installed over the barge pontoons to minimize the potential for clay materials to be released during barge loading and transport. In addition, Mitigation Measure 5.7.1 states that turbidity would be monitored to assess the effectiveness of control measures. The SWPPP would describe these site-specific monitoring methods. Loading and unloading operations would also be confined to designated areas that would be isolated from the rest of the reservoir by turbidity barriers.

The SWPPP would also specify appropriate construction and material transport and stockpiling practices to reduce the discharge of sediment and other construction materials as well as increases in turbidity of Calaveras Reservoir. These practices would include using drip pans under all vehicles and equipment; ensuring equipment stored or used in streambeds or on docks and barges is not leaking; storing equipment that is not in use away from concentrated flows; providing proper training of staff regarding spill control measures to be employed and reporting any spills; and installing turbidity barriers around the work area during dredging and jetty/dock construction. Dredged materials would be disposed of immediately and would not be stored or dewatered on site. Dredged materials would also be tested to determine proper options for treatment and disposal if the soil is contaminated.

Project BMPs would reduce water quality impacts from barging activities on Calaveras Reservoir. To reduce the potential impacts from accidental spills of hazardous materials during barge operations, Mitigation Measure 5.7.1 requires the SFPUC or its contractor(s) to prepare and implement a spill prevention and response plan. The spill prevention and response plan would specify procedures for spill cleanup and immediate notification of the CDFG and RWQCB of any spills and cleanup procedures. Spill cleanup equipment would be maintained in proper working

condition, and spill kits and cleanup materials would be available at all drilling and pile-driving locations. To reduce the possibility of accidental spills or releases of contaminants, hazardous materials handling, storage, and spill response procedures would be implemented in accordance with Mitigation Measure 5.7.1. The contractor would use appropriate procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations, which would minimize or eliminate the potential for discharge of pollutants to a watercourse.

Impact Conclusion

Dock construction and barge hauling operations could have significant impacts on the water quality of Calaveras Reservoir by increased turbidity and release of pollutants.

Mitigation Measure 5.7.1 addresses grading and erosion control, barge speeds, dredging techniques, solid waste management, hazardous materials handling and storage, and spill prevention and response. Implementation of this measure would reduce the potential impacts of Haul Option 2 on the water quality of Calaveras Reservoir to less-than-significant levels.

Operational Impacts

Impact 4.7.4: Impact on reservoir water quality during and following inundation due to contact with borrow materials containing NOA, metals, or contaminants.

The excavation and use of material for construction of the replacement dam, including soil from borrow areas and from the dam itself, could cause degradation of water quality. The replacement Calaveras Dam would require 2.77 million cubic yards of material. All of the material needed to construct the dam, except sand and gravel, would be obtained from excavation of the new spillway, as well as from borrow areas in the vicinity of the reservoir, which could contain NOA and metals. Although the potential to encounter hazardous materials in the soil and groundwater during construction of the new dam is low, there is a potential for soil material used in dam construction to contain elevated levels of natural contaminants, including NOA and metals. In addition, remnant contaminants (e.g., petroleum products) that would accumulate on haul roads over the course of the 4-year construction period could affect water quality if the contaminants were inundated when the new reservoir is filled. Turbidity would also be generated during reservoir refilling as water currents form and come in contact with haul roads and disposal sites.

If NOA- and/or metal-containing rock and soil were used in dam construction, these materials could be exposed to the reservoir water when the reservoir is refilled and thus be subject to leaching and mobilization. The same is true of Disposal Site 2 and minimal portions of Disposal Sites 3 and 7, where the dike at the toe of the fill would be submerged when the reservoir is refilled. The surface rock of those disposal sites could potentially contain metals that would be inundated by reservoir water and subsequently leached and mobilized into the reservoir water.

column, potentially exceeding Basin Plan water quality objectives for metals. With little available data, there is uncertainty regarding the degree to which these contaminants would be mobilized.

Freshly quarried blueschist containing metals and rock with NOA would be expected to undergo some physical/chemical alteration when placed in continuous contact with the reservoir. Thus, there may be a period when metals are mobilized and temporarily enter the water column. As the rock material weathers and becomes stable, it is likely that the concentrations of metals in the water would eventually drop off to current background levels. The amounts of metals and/or NOA released from hard rocks is likely to be very small compared to that of fill material and weathered rock containing these potential natural contaminants. This is because the total surface area of exposure to the water would be greater in the fill materials. In addition, materials that have been subject to long-term weathering in the dam could have metals that are more readily available for mobilization in comparison to freshly excavated rock. For these reasons, the most important action to be taken to reduce metals/NOA in the water column is the proposed encapsulation of the materials to prevent direct exposure to the reservoir water. It is unlikely there would be any impairment of drinking water beneficial use because, prior to its use, the raw water is treated at the SVWTP, where NOA, metals, and particulate are removed to required levels. There is no Basin Plan objective for asbestos. The primary human health concern is with airborne asbestos, not waterborne asbestos.

The potential for water quality impacts from erosion and sediment discharge would be minimized through the proposed encapsulation, proper surface slope and drain design, and vegetation cover of the disposal sites, which have been designed to prevent erosion of potential NOA- and metals-containing rock and soils. As described in Subsection 3.5.1.6, Disposal Sites, in Chapter 3, Project Description, the disposal sites would contain spoils derived from the Franciscan Complex; however, with the exception of rockfill from the upstream side of the existing dam and the toes of the disposal sites, excavated materials that may potentially contain NOA would be placed in the disposal sites at or above 760 feet (4 feet above the proposed normal maximum reservoir surface elevation of 756 feet) to prevent NOA from coming into contact with the reservoir surface water.

After construction, Borrow Area E would be shaped to drain, as it would be submerged when the reservoir is refilled. If used for disposal, Disposal Site 5 (located within Borrow Area E) would be under water after the reservoir level is restored to 756 feet. Materials that could potentially contain NOA would not be placed in this disposal site; therefore, no impact is anticipated at that disposal site.

A major earthquake on the Calaveras Fault could cause settlement or lateral displacement of the encapsulating materials on the replacement dam and at Disposal Sites 2, 3, and 7, resulting in a release of NOA, metals, or other hazardous materials into the reservoir. The design of the

proposed replacement dam accounts for settlement and displacement under both static and dynamic (e.g., earthquake shaking) conditions (see Section 4.8, Geology, Soils, and Seismicity). Thus, while a release of contaminants to the reservoir under such conditions as a very large-magnitude earthquake cannot entirely be discounted, the potential for exposure is low. Mitigation Measure 5.8.3, in Section 5.8, Geology, Soils, and Seismicity, requires the conduct of geotechnical investigations at all disposal sites where fill placement would result in a final slope greater than 20 feet in height and requires implementation of all measures specified in the geotechnical investigation report for the design and placement of the fills. With this mitigation, the potential for encapsulated NOA, metals, and contaminants in disposal sites to be mobilized and released into the reservoir would be less than significant.

Refilling the reservoir would inundate most of the west haul road, which could contain accumulated contaminants from haul trucks on its surface and in the gravel cover (including fuel, oil, transmission and brake fluid, antifreeze drip, brake-lining material, tire rubber deposits, etc.). While some of these contaminants may be washed out during rainstorm runoff, contaminants could build up on the road surface and in the gravel interstices over the approximately 2 years of heavy truck use (approximately 240 round trips per day) between Borrow Area E/Disposal Site 5 and the replacement dam site. The discharge of these contaminants into the reservoir when the road is submerged could expose aquatic or biological resources in the reservoir to harmful contaminants. There is uncertainty regarding the amount of these contaminants that could reach the reservoir. This evaluation conservatively assumes that Basin Plan water quality objectives for oil, grease, and toxicity could be exceeded by such a discharge of contaminants if mitigation is not implemented.

To reduce this potential impact, Mitigation Measure 5.7.1 requires a site survey to identify areas of oil staining on project roadways that would be inundated at the end of construction. Following the site survey, any areas of stained soil/rock would be removed prior to reservoir filling and inundation, and the removed material would be properly disposed of off site. Prompt cleanup of any spills on the road as provided by Mitigation Measure 5.7.1 would further reduce the at-source potential for contamination of the reservoir waters.

As discussed in Impact 4.7.1, sediment- and water discharge-generating activities would be controlled during construction of the replacement dam, and disturbed areas would be restored following the completion of construction. However, the inundated faces of the existing and replacement dams, the inundated Disposal Site 2, and the inundated portions of Disposal Sites 3 and 7 as well as Disposal Site 5 (if used) could cause releases of fine material, increasing turbidity in Calaveras Reservoir for a short period when the reservoir is first filled. About 1,000 linear feet at the base of the south side of Disposal Site 3 would be protected by riprap to minimize erosion, and erosion protection measures would be provided at Disposal Site 7 to prevent erosion and promote restoration of the slopes. Turbidity associated with these disposal

sites is expected to be local and temporary, and thus is not considered significant with regard to reservoir beneficial uses. Treatment of raw Calaveras Reservoir water at the SVWTP (an existing required process) would ensure that the impact of short-term increases in turbidity with respect to drinking water standards would remain at a less-than-significant level.

Under Haul Route Option 1, a haul road would be constructed on the west side of the reservoir. After the dam is constructed and the reservoir refilled, this road would be inundated and would lie mostly below the new water line at the 756-foot elevation of the filled reservoir (32 acres would be inundated). Approximately 3 acres of the west haul road would be located above 756 feet and would therefore not be inundated. Some sediment could be mobilized while this inundation occurs, but it is expected to be local and temporary and thus not significant with regard to reservoir beneficial uses.

Impact Conclusion

Inundation of the existing and replacement dam, disposal sites, and haul roads could result in the release of materials potentially containing NOA, metals, or contaminants into the reservoir. There is uncertainty about the amount and degree to which these materials could be released into the reservoir. Therefore, this evaluation assumes that the release or discharge of such materials into the reservoir could degrade water quality and adversely affect beneficial uses in the reservoir if mitigation were not implemented.

In accordance with Mitigation Measure 5.7.1, the disposal sites would be designed and constructed to minimize the potential for an accidental release of contaminants into the reservoir. In addition, Mitigation Measure 5.7.1 requires inspection of project roadways and staging areas that would be inundated at the end of construction to identify visible staining from spills or leaks of oil, grease, fuel, or other contaminants. Contaminated soil/rock identified in the inspection would be removed prior to reservoir filling and inundation. Mitigation Measure 5.9.2a requires the SFPUC to conduct a soils investigation to identify the extent of rock containing NOA and metals and to prepare an excavated materials management plan to provide for the proper classification and segregation of spoils by geologic type for placement in the disposal sites. With implementation of these mitigation measures, the potential water quality impacts resulting from the release of NOA, metals, and other contaminants during inundation of the dam, disposal sites, and haul road would be less than significant.

Impact 4.7.5: Changes in water quality parameters in Calaveras Reservoir during future operation and restoration of pre-DSOD-restricted reservoir conditions.

Under the proposed project, Calaveras Dam would be replaced and the reservoir's pre-DSOD-restricted capacity would be restored (see Section 3.6, Project Operation, in Chapter 3, Project Description, for a description of reservoir operations). Restoration of pre-DSOD-restricted

reservoir conditions would affect water quality parameters in Calaveras Reservoir, including temperature, DO, and nutrient levels related to changes in reservoir levels, releases, and inflows. Compared with existing conditions, the reservoir would be maintained at a higher storage level. In addition, the new dam outlet works would allow greater flexibility to manage both in-pool and downstream conditions by providing a wider range of controlled releases, selective withdrawal, improved spill management, and bypass flows through the ACDD bypass facility. Maintaining higher overall storage compared with DSOD-imposed levels would create a larger hypolimnion, leading to similar or greater cold/cool-water volumes than now exist.

At the end of construction, an approach channel would be excavated through the west side of the cofferdam, and the remaining portion of the cofferdam would be left in place. Gravel/rock would be placed on the surfaces between the replacement dam and the cofferdam for erosion protection. The area between the replacement dam and the cofferdam would be inundated as filling of the reservoir occurs, resulting in the creation of a shallow, somewhat isolated region of the reservoir. The volume of water in this area would be small and would be expected to mix with the larger reservoir, thus resulting in negligible impacts on DO.

Temperature

The temperature impact under proposed operations is expected to be minimal in the reservoir and beneficial in Calaveras Creek downstream of the dam and in Alameda Creek. Maintaining higher overall storage volumes would create a larger hypolimnion than at present, leading to similar or slightly greater cold/cool-water volume that existed prior to DSOD restriction. Pre-DSOD-restricted summer cool-water pool volumes on the order of 25,000 to 35,000 acre-feet (AF) could again be expected with the proposed project. Seasonal thermal stratification dynamics would follow a similar pattern, with the onset of stratification occurring in April, and fall destratification largely complete by November. Annual cool-water stream releases would average approximately 3,700 AF (10 to 15 percent of cool-water pool). Release volumes would not deplete the cool-water pool and would not lead to substantial changes in the thermal structure of the reservoir. The cool-water pool would be made available for environmental releases under the 1997 MOU with CDFG, notably during the summer months when Alameda Creek has low flow, high temperatures, and low DO. Thus, operation of the reservoir in compliance with the MOU cool-water releases would have a beneficial impact on water quality in Calaveras Creek downstream of the dam, in Alameda Creek, and in downstream areas, including potentially the extended study area.

Dissolved Oxygen

Historically (i.e., before the DSOD restriction), Calaveras Reservoir experienced seasonal anoxia (DO concentrations less than 2 mg/L) during summer and early fall when thermal stratification occurred. In an effort to maintain aquatic habitat for fish and to minimize water quality impacts

under the baseline reduced reservoir storage condition, an oxygenation system was installed to ensure DO concentrations of up to 5 mg/L in the hypolimnion during summer periods. The oxygenation system has the flexibility to be operated in a larger reservoir and would continue to be operated when the dam is replaced. Thus, DO conditions would be equal to or improved over the existing condition, with DO concentrations maintained to reduce low-oxygen conditions in the hypolimnion. This would be a beneficial effect of the project.

Water Quality – Nutrients

As described above in Subsection 4.7.1, Setting, Calaveras Reservoir is mesotrophic; the SFPUC's implementation of oxygenation technology (hypolimnetic oxygenation system) has maintained or improved water quality within the reservoir under existing conditions and would continue to do so under the proposed operation. Proposed reservoir storage and operations would not affect the ability of the SFPUC to maintain water quality; with the oxygenation system in place, overall nutrient levels would likely be lower and algal biomass reduced compared with existing conditions.

Impact Conclusion

As described above, the proposed project would maintain or improve water quality parameters in Calaveras Reservoir during operation; therefore, impacts on these conditions would be beneficial.

Impact 4.7.6: Changes in water quality parameters in Calaveras and Alameda Creeks during future operation.

Under the proposed project, Calaveras Dam would be replaced and the reservoir's pre-DSOD-restricted capacity would be restored. Releases to meet the 1997 MOU, as described in more detail in Section 3.6, Project Operation, in Chapter 3, Project Description, would also be implemented and would have an impact on water quality parameters in Calaveras and Alameda Creeks, including temperature, DO, nutrients, and turbidity. Sluicing operations at the ACDD would also have a temporary impact on turbidity in Alameda Creek downstream of the ACDD. Releases pursuant to the 1997 MOU would occur from the proposed ACDD bypass tunnel whenever flow is available in upper Alameda Creek. Additional releases from Calaveras Reservoir would also occur pursuant to the 1997 MOU during periods when colder water is needed in Alameda Creek, and when flows are not available at the ACDD. Operational modeling indicates there would be a decrease in annual diversions from Alameda Creek to Calaveras Reservoir in dry and critical years compared to diversions under baseline DSOD-restricted operations, as more water would continue down Alameda Creek for MOU compliance purposes. However, during the wet months (December–February) of the above-normal and normal year types, more water would be diverted from Alameda Creek to Calaveras Reservoir as compared to diversions under baseline DSOD-restricted operations.

Calaveras Creek Downstream of Dam

The primary source of Calaveras Creek flow is water from Calaveras Reservoir releases and seepage flow. Releases via the cone valve to reduce reservoir levels, spills, and environmental releases to meet 1997 MOU flow requirements for fish habitat would be the main source of flows in the creek. Restored reservoir storage would reduce peak releases into Calaveras Creek under all but the heaviest wet-year storms. MOU flow releases have not occurred to date and would be a new flow condition in Calaveras Creek, particularly during the warm season.

Base flow⁴ due to seepage under the dam is small—0.5 to 1.0 cfs—and would not change substantially with the proposed project.

Temperature

Water temperatures under future operations are expected to be similar to or lower than those under existing conditions. Winter temperatures are expected to be low due to seasonally wet and cool conditions. Compared to DSOD-restricted operations (in effect since 2001), future operations would release less water from Calaveras Reservoir to Calaveras Creek during the cooler period of the year (December through March) in all but dry and critical year because more water would be stored in Calaveras Reservoir and less would be released downstream. Although the amount of water released would be less than under existing conditions during the wetter months of the wetter years, the releases would be consistent with the requirements of the 1997 MOU. Water temperatures in Calaveras Creek are expected to be similar to existing conditions during these times due to seasonally cool conditions from December through March. The amount of water released to meet the 1997 MOU would increase from existing conditions during dry and critical years, resulting in additional cold-water releases from Calaveras Reservoir and similar or lower water temperatures in Calaveras Creek downstream of the dam.

Under baseline conditions, no 1997 MOU releases occurred. The seepage water from the dam that forms the base flow is cool upon surfacing in the creek, but quickly warms due to the very small volume. During the warm periods of the year (April through October), Calaveras Creek water temperatures are expected to be lower than under existing conditions because in addition to the base flow, releases of cool water would occur in order to meet the 1997 MOU temperature-based releases from Calaveras Reservoir. In addition to the increase in the quantity of releases made during warm periods of the year under future operations, release water temperatures are expected to be similar or lower under future operations during the warm periods of the year because of the deeper pool of cool water held in the reservoir. As described in Impact 4.7.5, future operations would maintain higher overall storage volumes in Calaveras Reservoir, which

⁴ Base flow is the flow in a river or stream that occurs in the absence of any recent rainfall.

would create a larger hypolimnion and lead to similar or slightly greater cold/cool-water volume. The cool-water pool would be made available for environmental releases.

This increased flow of cool water during dry and critical years, as well as during dry months, would generate a beneficial impact in Calaveras Creek and downstream in Alameda Creek within the primary study area because, under future flow conditions, waters from other sources would be relatively warm. Cooler water also would help to sustain DO (see following discussion). However, this situation would not lead to an appreciable thermal benefit far downstream, because the waters would gradually warm, attaining equilibrium with local streambed and meteorological conditions (see Alameda Creek discussion below). Studies conducted for the 1997 MOU between CDFG and the City and County of San Francisco contemplated that a 7-cfs release from Calaveras Reservoir would result in cooler temperatures for the upper half of the stream reach between the Alameda/Calaveras Creek confluence and the SVWTP (see Subsection 3.6.2, Fishery Releases, in Chapter 3 for additional detail on the 1997 MOU flow regime).

Facilities at the ACDD to allow bypass flows for the purpose of creating fish habitat and a specific release schedule would be consistent with the releases for fish in the 1997 MOU, except that the releases would be made from the proposed ACDD bypass when there is naturally occurring flow in upper Alameda Creek and supplemented as necessary with releases from Calaveras Dam. If MOU releases are from Alameda Creek upstream of Calaveras Creek, then Calaveras Creek would not receive the temperature benefits of these releases. Summer release flows, however, would be from Calaveras Reservoir in order to meet temperature requirements for fish, as upper Alameda Creek has minimal summer flow and commonly dries up in this reach.

Dissolved Oxygen

DO conditions downstream of Calaveras Dam would depend on water quality conditions in the reservoir. Because oxygenation has been implemented in Calaveras Reservoir since 2002 and would continue to be implemented with the proposed project, DO conditions of the source water would be similar to existing conditions maintained by the HOS. However, the cool water releases from the reservoir would result in enhanced DO levels when oxygenated by turbulent flow in the creek. The more oxygenated water would improve DO in waters in downstream reaches. Additionally, those enhanced DO levels would be sustained longer in downstream reaches than occur at present because the cooler water would slow biotic processes that remove oxygen from the water in warm weather. This would be a beneficial water quality effect.

Water Quality – Nutrients

Any improvements in water quality conditions in Calaveras Reservoir would also occur in released waters downstream of the dam. The trapping of nutrients in the reservoir sediments upstream of the dam could result in reduced nutrients conveyed into downstream releases that

would commingle those waters. In addition, oxidation of ammonia to NO_3 in the reservoir (“nitrification”) would minimize the potential for excess ammonia releases from the reservoir. These benefits would maintain low oxygen demands (due to the nitrification of ammonia to NO_3) as well as a low potential for un-ionized ammonia, which can be harmful to aquatic life.

Turbidity

Turbidity in Calaveras Creek and in Alameda Creek could increase due to continued releases through the large cone valve and spillway releases. As described in Impact 4.7.4, the quality of the water in Calaveras Reservoir would likely be temporarily degraded following filling, including increased turbidity from disturbed sediment. Thereafter, turbidity would return to conditions similar to existing characteristics (see Setting) in the reservoir. Releases would be fairly clear water. Periodic monitoring of surface water quality in Calaveras Creek and Alameda Creek, downstream of Calaveras Dam, is prescribed in Section 6.5 of the 1997 CDFG MOU (water quality monitoring) (see Appendix H). Monitored parameters include temperature, turbidity, DO, pH, hydrogen sulfide, copper, and ammonia. The MOU allows for negotiation of revisions to the Calaveras Reservoir water release schedule in response to results in the water monitoring data. If needed or recommended, these revisions would be made only after the SFPUC has been consulted and has approved them in advance.

Spillway releases have not occurred under current conditions due to the restricted reservoir levels, which have prevented such spills. Operational modeling indicates that operation of the replacement dam would result in fewer wintertime releases to Calaveras Creek downstream of Calaveras Dam than under baseline DSOD restrictions in wet, above-normal, and normal years during wet months, as more water would be stored behind the dam for SFPUC system operations (see Subsection 4.6.2.3, Project Impacts, in Section 4.6, Hydrology, for additional information regarding monthly releases).

The spillway chute downstream of the crest would be a rectangular, concrete-lined channel. The lower part of the spillway would include chute blocks that would break the speed and energy of the flow in the spillway as it discharges into the stilling basin. Both the spillway and the large cone valve would discharge into a stilling basin. Below the stilling basin would be a discharge channel that would be excavated in rock and, if necessary, the walls would be stabilized with shotcrete and bolting. The stilling basin and discharge channel would dissipate the energy from the spillway and cone valve discharges and protect the spillway area from erosion and undermining. The stilling basin would collect sediment discharged through the spillway or large cone valve before the water is released to the discharge channel and subsequently to Calaveras Creek below. There would also be two new low-flow valves, each capable of releasing from 0.5 to 35 cfs, that would discharge water to a separate energy dissipater before releasing it to Calaveras Creek. The new low-flow valves would be used for water releases to maintain fisheries and aquatic habitat, as called for under the 1997 MOU.

Generally, little suspended sediment would be expected in these discharges, as most of this material would settle out in the reservoir before the water passes over the spillway or enters the conveyance structure for the cone valve or low-flow valve release. Suspended fine material (clays) and dissolved solids, however, could be present in the reservoir column, as both cone valve and spillway releases during large storm events would cause a large inflow of sediments into the reservoir. During such events, settling times might be insufficient to remove all of the suspended sediment, thus resulting in discharges of somewhat turbid waters into the stilling basin. During such releases, the stilling basin would likely allow a substantial portion of suspended fine material to pass through into Calaveras Creek; however, these releases are expected to have turbidity levels equal to or lower than the background levels in Alameda Creek and other downstream unregulated tributaries when such events would occur. When spills or cone valve releases occur, the discharge is large, as is the dilution.

A key source of increased turbidity would be the mobilization of sediments in the creek itself due to the large volume of the discharge from the stilling basin during high-flow periods in large storm events (see Impact 4.6.9 in Section 4.6, Hydrology). It is not expected that such material suspension and increased turbidity in the waters would be substantially greater than natural background conditions because large stream flows and similar increased mobilization and suspension of sediments would also be anticipated in Alameda Creek (and throughout the watershed) during the same storm event. The primary effect might be an attenuation of turbidity generated by cone valve and spillway releases from Calaveras Reservoir because of the lag time for sediment-laden inflow into the reservoir. Storms and peak stream flows are generally of relatively short duration in the watershed. As storm peaks pass over the watershed, the response in stream flow is rapid. Water is captured and directed into Calaveras Reservoir and reduces the peak stream flow. If the reservoir is at a high level, then releases would be made through the cone valve or spilled. If the reservoir operator anticipates a large storm event, cone valve releases could occur even before the storm inflow peaks to avoid a spill. Once the release is initiated, it could continue for some variable time period after the peak inflow because water would continue to fill the reservoir for some time after the storm subsides. This situation could result in longer duration releases from the reservoir via the cone valve and spillway than under natural conditions; however, release durations under the proposed project would be similar to current DSOD-restricted releases that occur through the cone valve and thus would be within the range of existing flow and turbidity in Calaveras Creek downstream of the dam and in Alameda Creek.

Alameda Creek from Below ACDD to Confluence with Calaveras Creek

Figure 4.6.13a, Modeled Flows in Alameda Creek Downstream of the ACDD (1920-1959), and Figure 4.6.13b, Modeled Flows in Alameda Creek Downstream of the ACDD (1960-2002), in Section 4.6, Hydrology, show the modeled monthly flow passing the ACDD in Alameda Creek under existing and proposed conditions.

Temperature

Water temperatures in Alameda Creek in the vicinity of the ACDD reflect seasonal meteorological conditions (cool winter, warm summer, and intermediate spring and fall temperatures). With implementation of the proposed project, Reach A-4 would experience lower flows under future operations than existing conditions due to diversions at the ACDD during the wet months (December through February) in wet, above-normal, and normal water years. Although less flow would pass the ACDD during these times, little difference in temperature would likely result due to the cool water in Alameda Creek, cool ambient temperatures, and the continued high flows, despite their being lower than under existing conditions. During dry and critical years, Alameda Creek flows downstream of the diversion dam to the creek's confluence with Calaveras Creek would be higher under future operations than under existing DSOD-restricted operations, resulting in similar or slightly lower water temperatures in this reach.

In all other months of the year (March through November) when water is flowing in the creek, Alameda Creek flows downstream of the diversion dam to the creek's confluence with Calaveras Creek would be higher under future operations than under DSOD-restricted operations. As a result, water temperature conditions in Reach A-4 would be expected to be similar or somewhat lower compared to existing conditions due to a larger volume and rate of water passing over the ACDD and being bypassed around the ACDD. During summer, Alameda Creek flows would be low or even entirely dried up, and even with bypass flows the water would be subject to warming effects. However, the assurance of proposed bypass flows in winter and spring would likely result in larger pools that last longer through the summer, and these bypass flows would therefore present more consistent temperature conditions for aquatic life than have occurred under existing conditions, under which no releases are made between approximately May and October/November.

Overall, impacts on temperature in the creek downstream of the ACDD would be less than significant, as temperatures would remain similar to or would be slightly lower than those under existing conditions.

Dissolved Oxygen

Although minimal DO data exist for Alameda Creek throughout much of its watershed, DO conditions in the creek are presumed to be consistent with other wildland creeks of the Bay Area (i.e., near saturation, and in equilibrium with the atmosphere). Under future operations, decreases in flow would be largely limited to December through February in wet, above-normal, and normal year types. Although there would be a reduction in flow passing the ACDD at these times compared to existing levels, DO conditions are not expected to change measurably; flows would be decreased only during the wet season in wet, above-normal, and normal year types. The proposed bypass flows would result in a potential improvement in DO conditions downstream of the ACDD compared to existing conditions by providing more water during lower-flow periods,

which include dry and critical year types as well as between March and June of all year types. Although bypass releases have been modeled for July through November, they are generally very small in size and would only occur if water is available for release. These small releases between July and November would not be expected to have an impact on DO conditions in the creek.

Water Quality – Nutrients

Alameda Creek upstream of the ACDD is largely an undeveloped watershed with no storage reservoirs. Nutrient sources are largely natural or derived from cattle grazing. This fact, coupled with flow changes that would be largely limited to December through April (when primary production is low), suggests that water quality impacts due to future operations are not likely to change nutrient conditions in the reach of Alameda Creek downstream of the ACDD.

Settleable Materials, Suspended Materials, and Turbidity

Three water quality parameters—settleable materials, suspended materials, and turbidity—could be affected by changes in the ACDD operations and sediment flushing procedures. It is likely that more sediment would be transported to Calaveras Reservoir with the proposed operations than under current conditions because of increased flows diverted to Calaveras Reservoir from Alameda Creek during the wettest months (December through February) of the wettest years when most of the sediment is mobilized. Almost all of these sediments would settle out in the reservoir, reducing the overall commensurate quantity of sediments in the creek. During dry and critical years as well as from March through June of all year types, more water would be bypassed through the ACDD to Alameda Creek, which could result in short-term increases in settleable materials, suspended materials, and turbidity. However, these releases are expected to contribute only minimally to the overall suspended sediment load and turbidity in the flows.

Sluicing is the procedure of washing accumulated sediments from behind a dam into downstream watercourses, as described in Subsection 4.6.1.1, Existing Conditions, in Section 4.6, Hydrology, under “Operation of ACDD.” Sediment flushing of the ACDD involves the use of sluice gates to discharge approximately 900 cubic yards of sediment, typically sands and gravels, from behind the diversion dam each year. Sluicing typically occurs in February. The sluice gates are opened for 48 hours to flush sediment from the upstream side of the dam. Flushing operations occur whether or not any diversions of flow from the creek to the diversion tunnel are taking place. The sluice gates remain closed year-round except during the sluicing procedure. If water is not diverted via the diversion gates to the reservoir, the entire volume of the creek flows over the top of the dam. The SFPUC sediment flushing activities would continue as under existing operations, and sediment transport from sluicing would likely be similar under the proposed project compared with existing conditions over time.

No water quality data are available for Alameda Creek immediately downstream of the diversion dam for use in analyzing the direct water quality impacts associated with sediment flushing

behind the dam. However, water quality data collected by the ACWD and analyzed for TDS were examined to identify the general characteristics of TDS farther downstream in Alameda Creek (see Table 4.7.4). Samples were collected at approximately 5-day intervals near Sunol in Alameda Creek, above Arroyo de la Laguna, from 1997 through 2005, on a total of 270 days. This sampling location is about 10 miles downstream from the ACDD, and the water quality of Alameda Creek at this location is affected by numerous upstream inflows and land uses, including the diversion dam, Calaveras Dam, Welch Creek, Turner Dam, and gravel mining operations and quarries.

Review of the ACWD data at Sunol indicates that high levels of TDS occurred on numerous occasions during this period. The TDS levels were largely independent of season and flow. Because high TDS levels were recorded throughout the year and under a wide range of flow conditions, it is not clear whether the elevated TDS levels are related to natural watershed processes (e.g., erosion) and/or land use activities in the watershed. There is no correlation between the TDS levels and the SFPUC's annual 48-hour sediment flushing operation at the ACDD that typically occurs in February. Therefore, it is assumed that implementation of the proposed project would not affect TDS levels, and the water quality impact would be less than significant.

The ACWD also collected turbidity data for Alameda Creek near Sunol. The data show that turbidity was below 50 NTU approximately 95 percent of the time, and that turbidity exceeded 50 NTU on 14 days (see Table 4.7.10). Elevated turbidity was largely associated with elevated flow rates and occurred throughout the December-through-March period, and it is an existing phenomenon within the watershed resulting from high wet-weather flows and associated erosion and sediment transport in the watershed. Under the project, these sediments would presumably be transported downstream at a rate determined by the carrying capacity of the creek, as they are under existing conditions, and the associated turbidity levels would occur.

Table 4.7.10: Dates When Turbidity Exceeded 50 NTU in Alameda Creek Near Sunol, Above Arroyo de la Laguna (1997–2005)

Date	Turbidity (NTU)	Flow (cfs)	Date	Turbidity (NTU)	Flow (cfs)
12/2/1997	100	18	1/18/2000	141	80
12/12/1997	100	301	1/25/2000	93.4	250
12/15/1997	182	83	2/15/2000	81.5	30
1/12/1998	1,000	600	2/29/2000	65.7	650
2/16/1998	117	1,500	3/6/2000	56.8	730
2/24/1998	171	2,300	3/5/2002	112	10
2/9/1999	1,000	1,000	2/26/2004	347	350

Source: ACWD. Note that ACWD TDS data may not have been subject to the rigorous QA/QC procedures required for scientific studies, and therefore should be used only to indicate general conditions, unless otherwise specified by the ACWD.

Operation of the proposed bypass structure at the ACDD would maintain the transport of sediment during periods of low flow to some extent and would transport finer-grained material, which would act to reduce the amount of the sediment slug passed during sluicing/flushing. Thus, due to the increase in bypass flows under the proposed project as well as increased diversions to Calaveras Reservoir during the wettest months and year types, less sediment volume would likely be available for transport via sluicing/flushing operations down Alameda Creek in some years compared to the existing condition. However, because of the wide range of flows in the creek, which include episodic high flows, the amount of material mobilized at the ACDD would vary widely from year to year. Over time, these variations would tend to be evened out in cycles by sluicing. Such cyclical sluicing would be within the range of conditions during the baseline period. Therefore, the sluicing/flushing procedures under the proposed project would have a less-than-significant water quality impact with respect to settleable materials, suspended materials, and turbidity. In addition, the 48-hour sediment flushing operation is assumed to have a less-than-significant water quality impact because flushing operations occur during high-flow events when suspended material is typically naturally elevated. Sluicing activities would therefore add minimally to the overall suspended sediment load and associated brief increases in turbidity in the flows in Alameda Creek.

Downstream of Confluence of Alameda Creek with Calaveras Creek to Confluence of Alameda Creek and Arroyo de la Laguna

Figure 4.6.15a, Modeled Flow in Alameda Creek Downstream of the Calaveras Creek Confluence (1920-1959), and Figure 4.6.15b, Modeled Flow in Alameda Creek Downstream of the Calaveras Creek Confluence (1960-2002), in Section 4.6, Hydrology, show the modeled monthly flow in Alameda Creek downstream of the confluence with Calaveras Creek.

Temperature

Downstream of the Alameda Creek confluence with Calaveras Creek, lower Calaveras Creek temperatures associated with future operations of Calaveras Dam would also affect Alameda Creek temperatures down to the confluence with Arroyo de la Laguna. The effects would be moderated because of the mixing with Alameda Creek flows. Cooler waters in Calaveras Creek would commingle with Alameda Creek flows and generally approach equilibrium temperature in response to local meteorological conditions and channel conditions as waters traverse this reach. During winter periods, water temperatures would be the same under future conditions. During summer periods, flows from Calaveras Creek are expected to be at less than equilibrium temperature (i.e., cooler than Alameda Creek waters) at the confluence, as water would be drawn from cool-water sources within the reservoir. The result is that proposed Calaveras Creek flows would reduce Alameda Creek water temperatures. It is likely that these waters would warm gradually towards equilibrium over the next several miles of Reaches A-2 and A-1. These

findings follow those in the Bookman-Edmonston Engineering study (1995, p. 3-12) indicating that the proposed releases would gradually warm downstream, which is consistent with the 1997 MOU's objective to improve cold-water fisheries in the upper 2.5 miles of the enhancement area (the area of fishery habitat improvement intended by the 1997 CDFG MOU flow releases), and to improve native warm-water fisheries in the lower portion of the enhancement area (CDFG 1997). The overall influence on temperatures of the summer releases downstream of the confluence with Arroyo de la Laguna for normal and wet years would be difficult to identify because of the effects of the temperature of flows in Arroyo de la Laguna. Thus, while project temperature effects on flows in the extended study area are possible, they are likely to be negligible.

Dissolved Oxygen

Both Alameda and Calaveras Creeks are expected to have DO conditions at or near saturation under existing and future conditions. Deviations from saturation concentration could occur in response to primary production (photosynthesis and respiration of algae), but these conditions are not expected to change under proposed operations. Overall, DO conditions in Alameda Creek are not expected to change substantially under future operations.

Water Quality – Nutrients

Any reduction in nutrients and algae in Calaveras Reservoir would also occur in released waters downstream of the dam, and potentially in Alameda Creek as well. The impact of these reductions in Alameda Creek downstream of the confluence of Calaveras Creek is uncertain. Nutrient and algae conditions in Alameda Creek under future operations are expected to be similar to or within the range of variation of existing conditions.

Total Dissolved Solids and Chloride

As measured by the ACWD from 2003 to 2007, TDS and chloride concentrations in Alameda Creek upstream of the Arroyo de la Laguna confluence average 280 mg/L and 28 mg/L, respectively (RWQCB 2008, Appendix F-1, p. 14). Downstream of the confluence with Arroyo de la Laguna, both TDS and chloride concentrations in Alameda Creek increase substantially due to mixing with flows coming from Arroyo de la Laguna. Arroyo de la Laguna is the primary contributor of TDS and chloride to Alameda Creek downstream of the Alameda Creek–Arroyo de la Laguna confluence. High concentrations of TDS and chloride in Arroyo de la Laguna are expected to derive from natural groundwater seepage into the channels. Overall, TDS and chloride conditions in Alameda Creek are not expected to change substantially under future operations, and therefore impacts on creek habitat in the extended study area and on the ACWD water supply are not expected.

Impact Conclusion

The proposed project operations would not substantially degrade water quality parameters in Alameda and Calaveras Creeks compared to existing conditions; therefore, impacts on these conditions would be less than significant. Project design, including a stilling basin and subsequent discharge channel downstream of the cone valve and spillway, would reduce turbidity in Calaveras Creek and would be expected to be similar to background levels during such events; therefore, the impact would be less than significant. Implementation of MOU flows would be expected to have beneficial water quality impacts in Calaveras Creek and the downstream reaches of Alameda Creek to about the Sunol area.

Impact 4.7.7: Changes in groundwater quality related to construction and operations.

Construction and operations of the proposed project could affect groundwater quality in the Sunol Valley and Niles Cone. Any construction-related runoff and associated sediment and contaminants that are captured in Calaveras Reservoir during construction (when releases are not being carried out from the base of Calaveras Reservoir) are considered to have a less-than-significant impact on groundwater quality. For asbestos in particular, while fibers may be carried long distances by water before settling, they do not migrate to groundwater through soils (USEPA 2006). Construction-related contaminants or sediments mobilized downstream of Calaveras Dam during storm events could be carried downstream and affect groundwater quality. The extent to which metals and construction-related contaminants could be mobilized and transported into groundwater is uncertain with available data. It is possible that contaminant plumes in groundwater related to spills or elevated natural metals could occur during construction near the reservoir and in Calaveras Creek, and therefore a conservative assessment suggests that this would be a potentially significant impact. Implementation of a SWPPP that contains, at a minimum, the project-specific BMPs set forth in Mitigation Measure 5.7.1 would reduce the potential impacts on groundwater quality due to the release of hazardous materials, NOA, and metals during construction to less-than-significant levels.

As described in Section 4.6, Hydrology, the Alameda Creek watershed is characterized by two main geologic units. The deepest bedrock is compact in nature, has low permeability, and is considered non-water-bearing or very low water-yielding. The younger, surficial deposits are unconsolidated and only slightly compacted. The lower portion of this sequence (Livermore Gravels) is more consolidated than the upper portion and is less water-bearing. The upper coarser-grained sand and gravel beds (Quaternary alluvium) have high porosity and permeability and are considered water-bearing and high water-yielding. Downstream of the reservoir, the alluvium is relatively confined to a narrow canyon bottom. The contact between the relatively impermeable Livermore Gravels and the highly permeable shallower zone decreases the potential for recharge of the Livermore Gravels via alluvium.

Construction activities could result in short-term increases in NOA and metals, which have the potential to affect groundwater quality if stormwater containing increased NOA and metals were mobilized and sediment were carried downstream in Calaveras Creek and infiltrated into the alluvium. As noted in the Setting, asbestos was identified in alluvium in Calaveras Creek and therefore is part of the background condition. The above-described situation is hypothetical and uses the conservative assumptions that sediment would be released into Calaveras Creek and that it would be able to infiltrate into the groundwater basin, which is not expected. As noted above, asbestos fibers may settle in alluvium but do not migrate to groundwater through soils (USEPA 2006). However, with implementation of mitigation measures, construction activities would not generate substantial contaminants that would affect downstream groundwater quality. Potential groundwater quality impacts from infiltration of natural or construction-related contaminants during project construction would be mitigated through the implementation of a SWPPP that contains, at a minimum, the project-specific BMPs set forth in Mitigation Measure 5.7.1. These BMPs are accepted practices that have been successful in achieving Basin Plan water quality objectives.

In accordance with Mitigation Measure 5.7.1, BMPs would be implemented during construction to minimize erosion and sediment transport from the construction areas, haul roads, borrow areas, laydown/staging areas, and disposal sites. Mitigation Measure 5.7.1 also requires the SFPUC or its contractors to monitor turbidity during construction downstream of the project to assess the effectiveness of control measures and protect water quality. The SWPPP would describe site-specific monitoring methods. If monitoring identified elevated levels of turbidity, asbestos, or metals, treatment would be imposed to ensure that levels were within established water quality standards. In addition, the SFPUC would notify the RWQCB, ACWD, Alameda County Department of Environmental Health, and EBRPD in the event of elevated turbidity in any waterways in the Alameda Creek system potentially affected by the project.

The excess water generated during implementation of dust control measures and on-site equipment washing would be controlled, monitored, and treated as necessary prior to discharge to a receiving water body and potential infiltration. Mitigation Measure 5.7.1 states that in areas containing NOA, treatment of drainage and runoff water could include coagulation/flocculation (if necessary), sedimentation, and filtration.

The SWPPP would also require hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from the use of hazardous materials or accidental spills or releases of contaminants. In addition, the SWPPP would specify that the contractor would not allow the discharge water from equipment washing to percolate into the ground. Monitoring would be conducted to ensure that all BMPs are implemented, maintained, and effective. With the implementation of Mitigation Measure 5.7.1, which includes accepted BMPs that have been demonstrated to be effective at achieving Basin Plan water quality

objectives, the potential impacts on groundwater quality from NOA, metals, and pollutants would be less than significant.

During project construction, groundwater encountered during excavation at the construction sites, including the sites of the proposed replacement dam and spillway, borrow sites, and disposal sites, would be controlled by a system of dewatering sumps, wells, and pumps. In addition, surface runoff could collect in excavated areas, adding to the total volume of water that would need to be removed. Surface water produced and collected during construction could contain sediments and contaminants that could degrade groundwater quality if the water were discharged directly to surface water and infiltrated to the groundwaters. The discharge of such water could exceed Basin Plan objectives, resulting in a significant impact on groundwater quality.

In accordance with Mitigation Measure 5.7.1, treatment of collected surface and groundwater in NOA-containing areas may include coagulation/flocculation (if necessary), sedimentation, and filtration. For non-NOA-containing areas, treatment may include only sedimentation. The SWPPP would also include a dewatering plan designed to address potential water quality impacts from construction site dewatering. Implementation of the dewatering plan in addition to compliance with the permitting requirements described above would ensure that the impacts of construction-related dewatering discharges on groundwater quality would be less than significant.

As discussed in Section 4.6, Hydrology, the proposed project would seasonally reduce flows in Alameda Creek in the wettest year types during high-flow months due to diversions and increase flows in the low-flow months due to MOU releases. The overall effect of these changes in groundwater supplies downstream in the Sunol aquifer areas is expected to be minor (either slightly positive or slightly negative), depending on the year's rainfall and seasonal conditions. Operational water quality impacts on surface water temperature, DO, nutrient levels, settleable materials, suspended materials, and turbidity downstream of the ACDD are analyzed in Impact 4.7.6 and were determined to be less than significant.

The proposed project would increase storage in Calaveras Reservoir, which would increase groundwater levels around the perimeter of the reservoir. The proposed dam would also result in continued low-level base flow beneath the dam, which is not significant by itself but would contribute to the continued support of riparian vegetation along Calaveras Creek. The groundwater in these areas is not used as a water supply, as noted in Section 4.6.1.1, Existing Conditions, in Section 4.6, Hydrology.

Given the above considerations in regard to groundwater effects, operation of the project would not introduce substances that would cause groundwater quality impacts. Calaveras Reservoir would contain high-quality water, which would enter groundwater around and below the reservoir. Seepage through the replacement dam would not entrain contaminant substances in solution that could enter the local groundwater. Bypass flows at the ACDD would have the same

water quality characteristics of the watershed; that is, these flows would not introduce any new contaminants that could infiltrate into the groundwater of Alameda Creek.

Similarly, operation of Calaveras Reservoir, including releases via the low-flow valves for MOU flows and cone valve and spill discharges, would not introduce new contaminants into downstream creeks. Although construction activities could result in short-term increases in NOA and metals in the reservoir or Calaveras Creek, rock and soil containing NOA and metals is widespread in the watershed and the same substances would be discharged into Alameda Creek from many sources over a wide area; as previously discussed, data on NOA and metals from these sources are not available. In addition, sufficient unregulated tributary flow would occur to recharge the alluvium that transmits water in the Sunol Valley. While asbestos fibers may be carried long distances by water before settling, they do not migrate to groundwater through alluvial soils (USEPA 2006). In general, given the transport distances from Calaveras Reservoir for releases to downstream areas, and the dispersion into the alluvial sediments in the creek, changes in concentrations of NOA and metals in groundwater would be considered less than significant and would not affect the beneficial uses of groundwater, including potential use as drinking water.

Impacts on groundwater quality in the Niles Cone would be less than significant under the proposed project. Flows in Alameda Creek downstream of Niles Canyon (which recharge the Niles Cone) would be maintained within the range of flows and quality experienced since the Niles Cone began to be managed and used as a water supply resource including the baseline period.

See Impact 4.9.8 in Section 4.9, Hazards and Hazardous Materials, for additional discussion of the effects of raising the level of Calaveras Reservoir as it relates to the migration of the groundwater plume from the Calaveras Test Site at the south end of the reservoir.

Impact Conclusion

The project's minor changes in surface water releases and groundwater levels and the associated water quality would not substantially affect groundwater quality. However, construction-related runoff and associated sediment, contaminants, NOA, and metals could result in a degradation of groundwater quality if they infiltrate into the groundwater. In general, asbestos fibers do not migrate to groundwater through alluvial soils. However, with available data the extent to which other contaminants could be mobilized in groundwater is uncertain. Therefore, this analysis conservatively assumes this impact is potentially significant. Implementation of a SWPPP that contains, at a minimum, the project-specific BMPs set forth in Mitigation Measure 5.7.1 would reduce the potential impacts on groundwater quality due to the release of hazardous materials, NOA, and metals during construction to less-than-significant levels.

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4.8 GEOLOGY, SOILS, AND SEISMICITY

Section 4.8 Contents			
4.8.1	Setting	4.8.2	Impacts
	4.8.1.1 Regional Geologic Setting		4.8.2.1 Significance Criteria
	4.8.1.2 Site Geology		4.8.2.2 Approach to Analysis
	4.8.1.3 Soils		4.8.2.3 Project Impacts
	4.8.1.4 Existing Geologic Hazards		
	4.8.1.5 Regulatory Framework		

This section describes the geology, soils, and seismic hazards at and in the vicinity of the project site. The Setting subsection presents existing conditions with respect to the regional geology, including general topography, geologic materials, and structural geology (faults and folds). The Regulatory Framework discussion describes the pertinent federal, state, and local regulations and policies related to geology and geologic hazards. The Impacts subsection defines the significance criteria and presents a discussion of the approach to the impact analysis and a discussion of potential environmental impacts of the proposed Calaveras Dam Replacement Project (CDRP) related to geology, soils, and seismicity.

4.8.1 SETTING

Calaveras Dam and Reservoir are located in the Diablo Range, which lies within the Coast Ranges geomorphic province. The major geographic features in the San Francisco East Bay area include the Diablo Range, Santa Cruz Mountains, San Francisco Peninsula, and San Francisco Bay. The region consists of northwest-trending mountain ranges, broad basins, and elongated valleys generally parallel to the San Andreas Fault. In the Coast Ranges, older consolidated rocks are exposed in the mountains, but are buried beneath younger unconsolidated alluvial fan and fluvial sediments in the valleys and lowlands.

Calaveras Dam is located in a narrow, steep-sided valley along Calaveras Creek, whereas the reservoir floods the broad Calaveras Valley upstream. The proposed CDRP site is immediately downstream of the existing dam. Elevation of Observation Hill on the west side of the proposed dam site is 1,180 feet, and the ridge on the east of the dam rises to Elevation 1,600 feet. Elevation of the proposed replacement dam crest would be 772 feet, and the base of the dam in Calaveras Creek would be at Elevation 560 feet. Generally, the slopes that border the dam site and the reservoir are moderate to steep.

4.8.1.1 REGIONAL GEOLOGIC SETTING

Rocks in the northern Diablo Range belong to the Franciscan Complex of Jurassic and Cretaceous Age, the Cretaceous-Early Tertiary Great Valley Sequence, and Tertiary Age sedimentary units. Franciscan Complex rocks are found in the central part of the Diablo Range and generally east of

the Calaveras Fault and include sandstone, shale, conglomerate, greywacke sandstone, chert, greenstone, and serpentinite. Rocks of the Great Valley Sequence are generally located on the margins of the Diablo Range and consist of shale and sandstone with minor amounts of conglomerate. Near the Calaveras Dam site, Great Valley Sequence rocks are located on the west side of the Calaveras Fault (Graymer et al. 1996, p. 1 and Geologic Map). Tertiary marine sedimentary rocks of sandstone, siltstone, and shale overlie the Great Valley Sequence and generally occur west of the reservoir and on the west abutment of the dam site between the Gully Fault and the Spillway Fault. Finally, Quaternary/Holocene alluvium, colluvium, and landslide deposits overlie the bedrock units.

Structural geology in the region is dominated by major active strike-slip faults associated with the San Andreas Fault system. The geologic structure of the Diablo Range is characterized by northwest-trending faults and folds including the Calaveras Fault that generally forms the west boundary of the range. South of the reservoir, the Calaveras Fault branches northward into the southern Hayward and northern Calaveras Faults, which form the west and east boundaries of the East Bay Hills, respectively (URS 2005a, p. 3-1). The region is tectonically and seismically active.

4.8.1.2 SITE GEOLOGY

Subsection 4.8.1.2 Contents

Faults

Geologic Units

Dam Site

Reservoir Rim Area

Borrow Areas

Disposal Sites

Faults

Structural geology of the project area is dominated by the active strike-slip Calaveras Fault along which erosion processes formed the broad valley now partially filled by Calaveras Reservoir. Four secondary faults near the dam site were evaluated during the conceptual design phase of this project (URS 2005b, p. 2-4; WLA/URS 2005; and URS 2006a). The Quarry and Spillway Faults are located east and west of the dam, respectively, and were determined to be inactive according to the California Department of Water Resources (DWR), Division of Safety of Dams (DSOD) criteria (URS 2006a, p. 4-2). The Gully Fault is located about 1,500 feet west of the proposed dam site and was determined to be conditionally active, because there was insufficient geologic evidence to conclude that the fault had not ruptured within the past 35,000 years (URS 2006a, p. 4-2). All of these three secondary faults exhibit different geomorphic expression, strike, and activity than the Calaveras and Corral Point Faults.

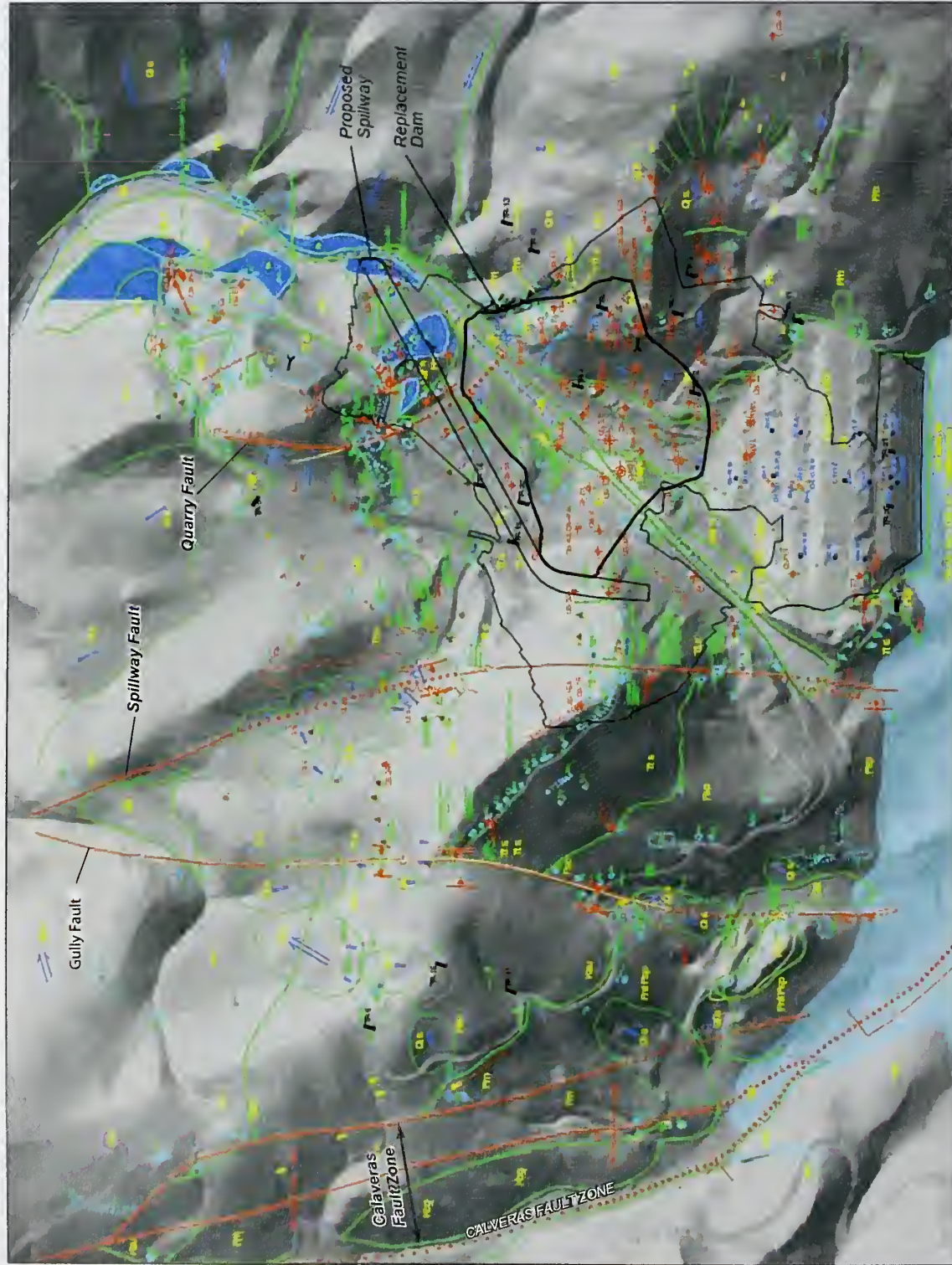
The Corral Point Fault has geomorphic expression indicative of recent fault activity and clear stratigraphic evidence of right-lateral offset. Based on this and other evidence, the Corral Point Fault is interpreted to be a primary active strand of the Calaveras Fault (URS 2006a, p. 4-2). The active Calaveras Fault passes from the east shore at Corral Point Fault northwest across the reservoir to join a strand along the west shore and then continues north through the gap located about 3,000 feet west of the proposed dam site.

Geologic Units

Geology at the dam site, reservoir rim, and borrow sites consists of three bedrock assemblages and several unconsolidated units (see Figure 4.8.1: Lithology and Geologic Features of the Project Site). These geologic units are described below by project subarea and a summary of the unit characteristics is provided in Table 4.8.1.

Dam Site

Geology at the dam site is partly complicated by the presence of the secondary faults and large landslides on the right abutment. Lying under the colluvium, alluvium, landslide debris, and part of the shell of the existing dam (fill), all of which would be removed in construction, the replacement dam would be founded on Franciscan Complex *mélange* at the channel bottom and east of Calaveras Creek and Temblor Sandstone to the west (URS 2005b, p. 3-1 and Figure 2D). The *mélange* consists of a mixture of serpentinite and sheared shale, with local blocks of greywacke sandstone, siliceous schist, and blueschist. The serpentinite and some rock types that form blocks within the *mélange* contain asbestos minerals (see Section 4.9, Hazards and Hazardous Materials, for further details). Temblor Sandstone is intensely fractured and locally includes thin shale and conglomerate interbeds. One large and several small landslides are located in the east abutment area. Subsurface exploration and testing (URS 2006a) identified open joints and high hydraulic conductivities in the Temblor Sandstone. Joint-filling materials are typically clay and calcite; a very limited occurrence of joints filled with water-soluble gypsum was noted in one core boring (CB-26) (URS 2005a). The Franciscan Complex *mélange* shale matrix with serpentinite blocks underlies about 70 percent of the dam foundation within the channel bottom and east abutment and is very weak to weak but has low overall hydraulic conductivity (URS 2006a). Landslide debris is highly variable in character and generally has low strength. Franciscan Complex rock, although geologically described as very weak to weak, with proper treatment is a suitable foundation material for earthfill dams. Due to the geologic variability at the dam site, the appropriate type of dam for this site is an earthfill structure that has the flexibility to accommodate the different strengths of the foundation materials.



SOURCE: URS geology mapping CAD file

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.8.1: LITHOLOGY AND GEOLOGIC FEATURES OF THE PROJECT SITE

Table 4.8.1: Summary of Geologic Units Near Calaveras Dam and Reservoir

Geologic Unit	Map Symbol ¹	Age	Lithology and Occurrence
Artificial fill	Haf	Historic	Man-made deposits generally of clay, sand, rock, riprap; placed for existing dam embankment
Alluvium	Qal	Holocene	Gravel, sand, silt and clay, unconsolidated; occur in Calaveras Creek channel and at south end of reservoir
Fluvial terrace deposits	Qt	Pleistocene	Gravel, sand, silt and clay; occur topographically higher than Qal
Landslide debris	Qls	Quaternary	Poorly sorted mixture of the source area formations; occur on moderate to steep slopes underlain by bedrock
Claremont Formation	Tcs	Middle Miocene	Thinly laminated siliceous shale; exposed between Spillway and Quarry Faults west of Calaveras Creek
Tembler Sandstone	Tts	Middle Miocene	Fine grained, slightly to moderately cemented, thick bedded sandstone; occurs on left abutment
Great Valley Sequence (Berryessa Formation)	Kcu, Kcg,	Cretaceous	Mudstone occurs west of Gully Fault on Observation Hill; Cobble Conglomerate occurs along Calaveras Fault zone near north shore of reservoir
Franciscan Complex ²	Fsp, Fb, Fm	Jurassic-Cretaceous	Serpentinite is generally weathered, weak, intensely sheared, waxy rock, occurs south and west of the existing dam between Spillway and Gully Faults; Blueschist is hard, strong, foliated to massive amphibolite schist, occurs primarily in Calaveras Creek north of the existing dam; Mélange is intensely sheared, with a weak shale matrix containing various sized blocks of greywacke sandstone, siltstone, shale, siliceous schist, serpentinite, blueschist, and igneous rocks, occurs throughout the right abutment
Notes: ¹ Map symbols are keyed to the map shown in Figure 4.8.1. ² Franciscan Complex is known to contain naturally occurring asbestos associated with serpentinite and amphibolite schist, which is discussed in Section 4.9, Hazards and Hazardous Materials.			

Source: URS 2005b

Reservoir Rim Area

Numerous small and large landslides were mapped along the west and east reservoir rims and the southern rim is a broad nearly flat alluvial fan crossed by Calaveras Creek. The landslides common to the west and east rims including Arroyo Hondo are formed in the weak bedrock of both the Great Valley Sequence and Franciscan Complex (URS 2005a, p. 7-1) and extend below the pre-DSOD restricted high water level of the reservoir down to the original stream channels. Lacking visible evidence of surface movement, the landslides are considered to be inactive, and aerial photograph review found no evidence of reactivation of the large ancient slides due to the inundation by the reservoir (URS 2005b, p. 3-3). Numerous small soil slumps and debris flows within the large landslides and near the reservoir rim are likely active.

Borrow Areas

Temblor Sandstone would be excavated for the west abutment of the dam and the spillway to provide the downstream shell material of the replacement dam. Clayey soil for the dam core would be obtained from the south side of the reservoir where alluvial deposits in Borrow Area E satisfy the grain size and plasticity requirements. Sand and gravel needed for the filter, drain, and concrete aggregate would be imported from off-site quarries, most likely the existing Sunol Valley quarries. Rockfill for the upstream shell and riprap for the upstream face of the dam and disposal site faces can be obtained from hard, strong blueschist and greywacke of the Franciscan Complex in the existing quarry located northwest of the replacement dam (Borrow Area B) (URS 2006a, p. 4-3). Rockfill and riprap excavated from the quarry was placed during buttressing in 1974 and would also be removed from the existing dam and reused. Borrow Area B, located north of the dam site, is proposed as a potential source of rockfill, coarse fill, and riprap (URS 2006a, p. 4-4).

Disposal Sites

Excess or geotechnically unsuitable material would be placed in three or four disposal sites. The process for selecting the disposal sites included consideration of geologic materials at those sites (like materials and geologic hazards) (Subsection 3.5.1.6, Disposal Sites, in Chapter 3, Project Description). The primary proposed disposal sites would be located 1) along the Calaveras Fault zone west of the existing dam (Disposal Site 3), 2) between the replacement dam and the existing dam (Disposal Site 2), and 3) north of Corral Point (Disposal Site 7). If needed, an additional disposal site (Disposal Site 5), located within Borrow Area E at the south end of the reservoir, would be used (URS 2006a, Figure 3-1).

4.8.1.3 SOILS

Soil types within the proposed project area were identified from soil survey data published by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS 2009). The six basic soil types mapped in the dam site, borrow areas, rim area, and disposal sites are as follows: Los Gatos-Los Osos complex, Perkins loam, Gaviota loam, Vallecitos rocky loam, Yolo loam, and rock land. All of these soils reflect the underlying geologic units of sandstone, shale, mélangé, and alluvial fan, terrace deposits, or river channel deposits.

All of the six soil types range from low to moderately corrosive to concrete, and low to highly corrosive to uncoated steel. Not all of the soil types are proposed for use in construction of the dam and appurtenances. The Los Gatos-Los Osos complex soils proposed to be removed from the left abutment area are moderately corrosive to concrete and uncoated steel. Yolo loam located at Borrow Area E (south end of the reservoir) has a low risk of corrosion to concrete and moderate risk against uncoated steel.

Erosion potential of the project site soils at the dam site and borrow areas is severe. At the dam site and borrow areas around Observation Hill, the exposed surfaces of the cut slopes are also severely prone to erosion, and the native soils are a poor source for road construction. Temporary access and haul roads in the Calaveras Valley and the reservoir rim are underlain by soils with severe potential for erosion.

4.8.1.4 EXISTING GEOLOGIC HAZARDS

Subsection 4.8.1.4 Contents

Slope Failure

Faulting and Seismic Hazards

Seismicity

Ground Shaking

Fault Rupture

Liquefaction

Lateral Spreading

Earthquake-Induced Settlement

Seismic Slope Instability/Ground Cracking

Unstable Dam Materials and Structure

Slope Failure

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Slope stability can depend on a number of complex variables, including the geology, structure, and amount of groundwater, as well as external processes such as climate, topography, slope geometry, and human activity. Landslides may occur on slopes of

15 percent or less; however, the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslides in the project area occur in all bedrock units and generally on steeper slopes.

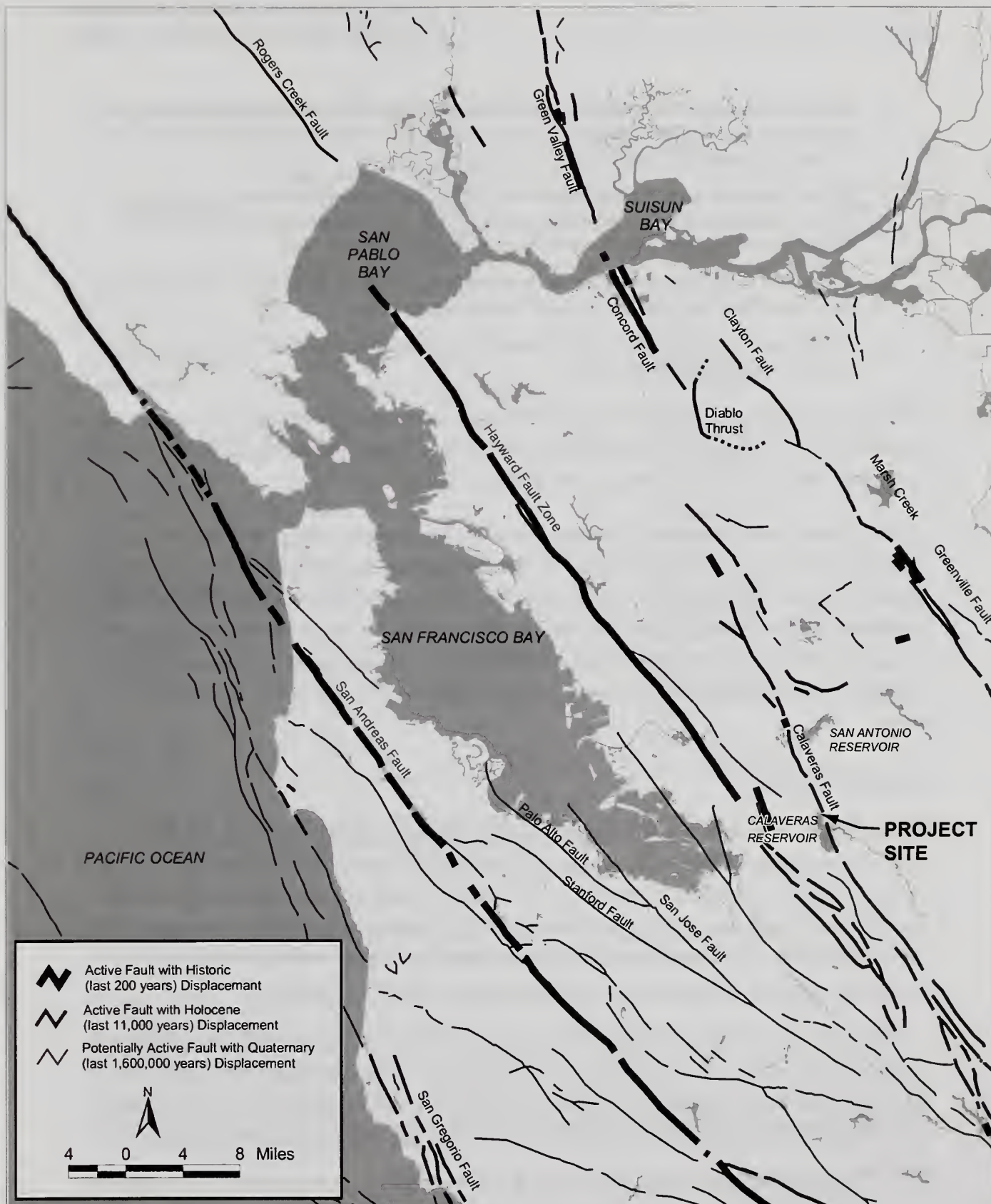
The proposed replacement dam site is located in an area of many small and large landslides mapped locally on steeper slopes on more than one bedrock unit. A large landslide (approximately 300 to 400 feet wide and over 1,200 feet long) is mapped on the right (east) abutment (URS 2006a, p. 4-2). This landslide, sometimes referred to as the “right abutment landslide,” poses substantial instability and hazard at the site such that it would require stabilization prior to dam foundation excavation. It is a combination rotational/translational landslide with a head at Elevation 950 feet and extending down to the toe of the dam site. Numerous ancient inactive landslides are mapped along the west and east rims of the reservoir although there is no evidence of slide movement caused by the creation of the original reservoir.

Faulting and Seismic Hazards

Seismicity

The project site is located within Seismic Zone 4, high hazard, as defined by the California Building Code. The project site, like all of the San Francisco Bay Area, is situated in a seismically active region near the boundary between two major tectonic plates, the Pacific Plate to the southwest and the North American Plate to the northeast. Since approximately 23 million years ago, about 200 miles of right-lateral slip has occurred along the San Andreas Fault zone to accommodate the relative movement between these two plates. The relative movement between the Pacific Plate and the North American Plate generally occurs across a 50-mile-wide zone extending from the San Gregorio Fault in the southwest to the Great Valley Thrust Belt to the northeast. In addition to the right-lateral slip movement between tectonic plates, a compressional component of relative movement has developed between the Pacific Plate and a smaller segment of the North American Plate at the latitude of San Francisco Bay during the last 3.5 million years. Strain produced by the relative motions of these plates is relieved by right-lateral strike-slip faulting on the San Andreas and related faults and by vertical reverse-slip displacement on the Great Valley and other thrust faults in the central California area.

The San Francisco Bay Area and surrounding areas are characterized by numerous geologically young faults (see Figure 4.8.2: Regional Fault Locations). These faults can be classified as historically active, active, potentially active, or inactive, based on the following criteria (CGS 1999):



SOURCE: ESA + Orion

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.8.2: REGIONAL FAULT LOCATIONS

- Faults that have generated earthquakes accompanied by surface rupture during historic time (approximately the last 200 years) and faults that exhibit aseismic fault creep¹ are defined as *historically active*.
- Faults that show geologic evidence of movement within Holocene time (approximately the last 11,000 years) are defined as *active*. The DSOD requires that fault activity be based on fault rupture event within the past 35,000 years.
- Faults that show geologic evidence of movement during the Quaternary (approximately the last 1.6 million years) are defined as *potentially active*.
- Faults that show direct geologic evidence of inactivity during all of Quaternary time or longer are classified as *inactive*.

Although it is difficult to quantify the probability that an earthquake will occur on a specific fault, this classification is based on the assumption that if a fault has moved during the last 11,000 years or 35,000 years, it is likely to produce earthquakes in the future.

The Calaveras strike-slip fault is an active fault of the San Andreas system that predominantly accommodates lateral movement between the North American and Pacific tectonic plates and is located very near the project site. Active blind and reverse thrust faults² in the project vicinity include the Mount Diablo blind thrust fault,³ located northeast of the project site. Faults in the project vicinity that represent substantial potential seismic sources are presented in Table 4.8.2. The project site is located near the boundary between the northern and central Calaveras Fault zones.

Ground Shaking

An earthquake is classified by the amount of energy released, which traditionally has been quantified using the Richter scale. Recently, seismologists have begun using a moment magnitude (M) scale because it provides a more accurate measurement of the size of major and great earthquakes. For earthquakes of less than M 7.0, the moment and Richter magnitude scales are nearly identical. For earthquake magnitudes greater than M 7.0, readings on the moment magnitude scale are slightly greater than a corresponding Richter magnitude.

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between a particular area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding that area. Earthquakes occurring on faults closest to the project area would most likely generate the largest ground motions.

¹ Fault creep is movement along a fault that does not entail earthquake activity.

² A thrust fault is a low-angle reverse fault.

³ Blind thrust faults are low-angled subterranean faults that have no surface expression.

Table 4.8.2: Significant Active and Potentially Active Faults in the Project Vicinity

Fault Name	Estimated Maximum Earthquake Magnitude^{1,2}	Approximate Fault Segment Length (miles)²	Average Recurrence Interval (years)³	Fault Type, Dip Direction²	Approximate Slip Rate (mm/yr)^{2,4}
San Andreas (Peninsula)	7.1	53	229	Right-Lateral Strike-Slip, 90 degrees	17.0
San Andreas (North Coast South)	7.4	118	223	Right-Lateral Strike-Slip, 90 degrees	24.0
Hayward (Northern)	6.4	22	155	Right-Lateral Strike-Slip, 90 degrees	9.0
Hayward (Southern)	6.7	33	161	Right-Lateral Strike-Slip, 90 degrees	9.0
Calaveras (Northern)	6.8	28	187	Right-Lateral Strike-Slip, 90 degrees	6.0
Calaveras (Central)	6.2	37	54	Right-Lateral Strike-Slip, 90 degrees	15.0
Mount Diablo	6.6	15	389	Reverse Thrust, 38 degrees northeast	2.0
Notes: ¹ Maximum Earthquake Magnitude – the maximum earthquake that appears capable of occurring under the presently known tectonic framework, using the Richter scale. ² Fault parameters from the California Geological Survey 2003. ³ Recurrence Intervals from USGS 2003. ⁴ References to fault slip rates are traditionally presented in millimeters per year.					

Source: Geotechnical Consultants based on data from the California Geological Survey and US Geological Survey

A review of historic earthquake activity from 1800 to 2005 indicates that 13 earthquakes of magnitude M 6.0 or greater have occurred within a 5-mile radius of the existing Calaveras Dam within this time frame. A summary of significant and/or damaging earthquakes is presented in Table 4.8.3. There have also been an additional 26 earthquakes with magnitudes between M 5.5 and M 6.0 in this area during this time period, including aftershocks of the larger earthquakes.

The intensity of earthquake-induced ground motions can be described using peak ground accelerations, represented as a fraction of the acceleration of gravity (g). The interactive

Table 4.8.3: Significant Historic Earthquakes in the San Francisco Bay Area

Date	Earthquake Magnitude¹	Name, Location, or Region Affected	Associated Fault	Comments²
June 1838	Assumed between 6.8 and 7.4	San Francisco Area	San Andreas	This earthquake is associated with probable rupture of the San Andreas Fault from Santa Clara to San Francisco (approximately 37 miles). Walls were cracked at Mission Dolores and in Monterey.
October 8, 1865	6.5	Santa Cruz Mountains	San Andreas	Caused severe damage in New Almaden, Petaluma, San Francisco, San Jose, Santa Clara, and Santa Cruz resulting in \$500,000 in property damage. Ground cracks, heaving, and subsidence were noted in several areas.
October 21, 1868	6.8	Hayward	Hayward	Felt throughout northern California and Nevada. Resulted in 30 deaths and \$300,000 in property damage. Occurred on the Hayward Fault with rupture from Berkeley to Fremont. Caused severe damage in the East Bay and San Francisco, destroyed Mission San Jose. USGS estimates M7.0.
June 20, 1897	6.2	Gilroy	Calaveras	Felt from Woodland to San Luis Obispo. Resulted in building collapse in the Santa Clara Valley. Fissures were noted on the Calaveras Fault southeast of Gilroy.
April 18, 1906	7.8	San Francisco Earthquake, San Francisco	San Andreas	This earthquake and the resulting fires caused approximately 3,000 deaths and \$524 million in damage (\$24 million from the earthquake alone). Destruction from this earthquake occurred at distances of up to 350 miles from the epicenter.
July 1, 1911	6.4	Morgan Hill	Calaveras	Located on the Calaveras Fault, caused substantial damage in Gilroy and the Santa Clara Valley. Felt as far away as Reno, Nevada.
January 24, 1980	5.8	North of Livermore Valley	Greenville	Occurred on the Greenville Fault with surface rupture of approximately nine miles. Resulted in numerous injuries and \$11.5 million in property damage (primarily at Lawrence Livermore Laboratory).

(continued)

Table 4.8.3: (Continued)

Date	Earthquake Magnitude ¹	Name, Location, or Region Affected	Associated Fault	Comments ²
April 24, 1984	6.2	Morgan Hill Earthquake, Morgan Hill	Calaveras	Earthquake was felt from San Francisco to Bakersfield and was located near the epicenter of the 1911 earthquake in Morgan Hill. Resulted in injuries and approximately \$8 million in property damage.
October 17, 1989	6.9	Loma Prieta Earthquake, Santa Cruz Mountains	San Andreas	Largest earthquake to occur on the San Andreas Fault since 1906. Resulted in 63 deaths, over 3,000 injuries, and an estimated \$6 billion in property damage. Severe damage occurred from San Francisco to Monterey and in the East Bay, and included damage and destruction of buildings, roads, bridges, and freeways.
<i>Notes:</i> ¹ Earthquake magnitudes and locations before 1932 are estimated by Real et al. 1978; Topozada et al. 1981 and 1982 based on reports of damage and felt effects. Magnitudes reported using the Richter scale. ² Earthquake damage information primarily compiled from the National Earthquake Information Center and the Berkeley Seismological Laboratory websites. Estimates of property damage values are in dollars valued to the year of damage.				

Source: Geotechnical Consultants with data from Real et al. 1978; Topozada et al. 1981 and 1982; USGS National Earthquake Information Center website (2009); and Berkeley Seismological Laboratory website (2009)

California Geological Survey (CGS) Probabilistic Seismic Hazard Assessment Map provides data to estimate peak ground accelerations in California. Taking into consideration the uncertainties regarding the size and location of earthquakes and the resulting ground motions that can affect a particular site, the map depicts peak ground accelerations with a 10 percent probability of being exceeded in 50 years, which equals an annual probability of 1 in 475 of being exceeded each year.

Another commonly used measure of earthquake intensity is the Modified Mercalli Scale, which is a subjective measure of the strength of an earthquake at a particular place as determined by its effects on persons, structures, and earth materials. The Modified Mercalli Scale for Earthquake Intensity is presented in Table 4.8.4, along with approximate earthquake magnitudes and average peak accelerations associated with each intensity value.

Table 4.8.4: Modified Mercalli Scale for Earthquake Intensity

Intensity Value	Intensity Description	Approximate Earthquake Magnitude (Richter)	Average Peak Acceleration
I	Not felt except by a very few persons under especially favorable circumstances.	1.0–3.0	
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.		
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	3.0–3.9	<0.015 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	4.0–4.9	0.015–0.03 g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.		0.03–0.08 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.		0.08–0.15 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	5.0–5.9	0.15–0.25 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	6.0–6.9	0.25–0.45 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.		0.45–0.60 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	7.0 and higher	0.60–0.80 g
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.		0.80–0.90 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.		>0.90 g

Source: Bolt 2004

Fault Rupture

Faults are geologic zones of weakness. Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1906 San Francisco earthquake extended for more than 260 miles with displacements of up to 21 feet. However, not all earthquakes result in surface rupture. The Loma Prieta earthquake of 1989

caused major damage in the San Francisco Bay Area, but the fault did not break the ground surface.

Fault rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they are accompanied by shaking. Calaveras Reservoir marks the boundary between the northern and central segments of the Calaveras Fault. The northern Calaveras Fault is estimated to be capable of 2 to 5 feet of fault offset (surface rupture) (WLA 2004, p. 20). Only the proposed access road extending east from Calaveras Road would cross the Calaveras Fault. Neither the existing Calaveras Dam nor the site of its proposed replacement is underlain by a trace of the Calaveras Fault. The rest of the project site would not be expected to experience surface rupture associated with an event on the Calaveras Fault.

Although future earthquakes could occur anywhere along the faults listed in Table 4.8.2, only regional strike-slip earthquakes of magnitude 6.0 or greater are likely to be associated with surface fault rupture and offset (CGS 1996). Triggered slip on secondary faults may result from large earthquakes on nearby active faults. However, triggered slip should not occur on the Spillway and Quarry Faults, which are considered inactive. The Gully Fault is conditionally subject to triggered slip although data are insufficient for a conclusive determination. This fault is not located at the dam site.

Liquefaction

Liquefaction is a phenomenon in which saturated granular sediments temporarily lose their shear strength and become fluid-like during periods of earthquake-induced, strong ground shaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude of earthquakes likely to affect the site. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

Holocene-aged alluvial sediments are especially prone to liquefaction. Older alluvial sediments deposited during the Pleistocene Epoch are generally not liquefiable because they tend to be more consolidated. The alluvial deposits located along Calaveras Creek including the Holocene-aged sediments subject to liquefaction do not pose a current hazard to the existing Calaveras Dam (but in any case would be removed during excavation and preparation of the proposed dam and spillway foundations to provide the proper foundation support on strong and low permeability materials). The alluvial deposits at the south end of the reservoir may be susceptible to liquefaction, but also pose no hazard to the existing dam or to the proposed replacement dam.

Liquefaction is not anticipated to occur in the consolidated bedrock or landslide deposits found around the reservoir rim sites.

Lateral Spreading

Of the liquefaction hazards, lateral spreading generally causes the most damage. This is a phenomenon where large blocks of intact, nonliquefied soil move downslope on a liquefied substrate of large areal extent (Youd et al. 1978 and Tinsley et al. 1985). The mass moves toward an unconfined area, such as a descending slope or stream-cut bluff, and can occur on slope gradients as gentle as one degree. Drainages and swales between hill slopes are generally filled by unconsolidated alluvium, colluvium, landslide debris, and slope wash. These conditions may be present around the rim of the reservoir, but they are not a threat to the existing dam or to the proposed replacement dam.

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials, particularly loose, uncompacted, and variably sandy sediments. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or bay mud. The soils and bedrock near the dam site and around the reservoir do not have these characteristics.

Seismic Slope Instability/Ground Cracking

Earthquake motions can also induce substantial stresses in slopes, causing earthquake-induced landslides or ground cracking when the slope fails. Earthquake-induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. The 1989 Loma Prieta earthquake triggered thousands of landslides over an area of 770 square miles. The steep slopes adjacent to the replacement and existing dam sites and the east and west reservoir rims area may be susceptible to seismic-induced instability.

Unstable Dam Materials and Structure

The existing Calaveras Dam was constructed using several different earth fill methods including hydraulic fill (sluicing), dumping and rolling. The upstream face of the dam failed during construction in 1918 due to increased pore water pressures resulting from the weight of the embankment materials that were not free draining. Reconstruction was completed in 1925 although much of the failed material remained in the dam covered by stronger fill. In addition, some of the sluiced material that did not originally fail remained in place in the downstream

portion of the dam (Olivia Chen Consultants 2003). Additional dam modification consisting of a 30-foot-thick rock layer, primarily on the upstream face, was added in 1974 to address seismic stability concerns. During 1990 and 1991, movement of the upstream face was noticed during a reservoir drawdown for outlet works modifications.

Subsequently, preliminary analysis by the DSOD (2001) and detailed geotechnical investigation and analysis by Olivia Chen Consultants (2003) concluded that the saturated portions of the dam embankment and some foundation materials are susceptible to liquefaction and that widespread cracking and slope failure is likely from maximum earthquakes on the nearby Calaveras Fault as well as maximum earthquakes on the San Andreas and Hayward Faults (Olivia Chen Consultants 2003). This analysis estimated that liquefaction would cause deformation of the dam and settlement of the crest by 23 to 60 feet. Irregularities and complexities of the existing dam structure present difficult conditions to make in-situ repairs such as ground improvement and dewatering of saturated zones. In addition, the repairs may cause further embankment instability by disrupting drainage paths or encouraging additional seepage erosion and piping, or simply be ineffective to reduce the liquefaction hazard. Consequently, relocation and reconstruction of the dam is considered a more feasible alternative to allow operation of the reservoir at current levels, provide a robust, well-engineered base if future dam enlargement is needed, and reduce the overall seismic hazard (Olivia Chen Consultants 2003).

4.8.1.5 REGULATORY FRAMEWORK

Subsection 4.8.1.5 Contents

Alquist-Priolo Earthquake Fault Zoning Act
Seismic Hazard Mapping Act
Division of Occupational Safety and Health
California Building Code
Division of Safety of Dams
Regional Water Quality Control Board
SFPUC Alameda Watershed Management Plan
SFPUC General Seismic Design Requirements

Geologic resources and hazards are governed primarily by state and local jurisdictions. Seismic hazards are addressed by state and local requirements for identifying and avoiding faults when considering new development. Seismic hazards for dams are regulated by the DSOD.

Alquist-Priolo Earthquake Fault Zoning Act

Surface rupture is generally the most easily avoided seismic hazard. The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface fault rupture to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones, called “earthquake fault zones,” around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot

be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch and there is the potential for ground surface rupture along any of the branches. Surface fault rupture and fault activity at dam sites are addressed by DSOD requirements for geologic mapping, subsurface investigation, and evaluation of fault activity.

Seismic Hazard Mapping Act

The Seismic Hazard Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The act directs the California Department of Conservation (CDC) to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground shaking. The act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation.

The Seismic Hazard Zone Map for Niles Quadrangle (CGS 2004) reveals a seismic-induced landslide hazard throughout much of the hillside areas north of the Calaveras Dam and Reservoir. The CDC has not published a Seismic Hazard Zone Map for the Calaveras Reservoir Quadrangle that covers the project site. As noted, the SFPUC has undertaken geologic and seismic hazard studies as reported here, including landslide hazards such as the east abutment landslide, which provide equivalent detail to meet the intent of the Act.

Division of Occupational Safety and Health

The Division of Occupational Safety and Health (Cal/OSHA) oversees underground construction and classifies the gas hazard of every tunnel project in accordance with Title 8 of the California Code of Regulations (CCR). The SFPUC may be required to request the gas hazard classification from the Mining and Tunnel Unit (MTU) of Cal/OSHA prior to the start of construction and modification of the Outlet Tunnel. The MTU enforces the Tunnel Safety Orders (TSO), which include the gas classification, preconstruction safety conference, personnel certifications, blasting licenses, and underground operation of diesel engines. Gas hazards associated with tunneling are discussed in greater detail in Section 4.9, Hazards and Hazardous Materials.

California Building Code

The 2007 California Building Code (CBC) is based on the 2006 International Building Code, with the addition of more extensive structural seismic provisions. The CBC is contained in the CCR, Title 24, or the California Building Standards Code, and is a compilation of three types of building standards from three different origins:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes;
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions; and
- Building standards, authorized by the California legislature, that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns.

Title 24, Part 2, Volume 2, Chapter 16 of the CCR contains definitions of seismic sources and the procedure used to calculate seismic forces on structures. The CBC covers grading and other geotechnical issues, building specifications, and non-building structures. The project would, by law, include these types of improvements and the CBC would be applicable. However, the Building Seismic Safety Council (BSSC) acknowledges that dams and other lifeline facilities are not typical non-building structures and are covered by other well established industry design criteria, and therefore are not typically under the jurisdiction of local building officials, and require technical considerations beyond the scope of the CBC (BSSC 2003). In addition, California Water Code Section 6026 provides that no city or county has the authority to regulate, supervise, or provide for the regulation or supervision of any dam or reservoir in California that is under DSOD jurisdiction; the State has exclusive jurisdiction over construction and operation of jurisdictional dams like Calaveras.

Division of Safety of Dams

The DWR, with regulatory power from the California Water Code, delegates dam safety to the DSOD to protect people against loss of life and property from dam failure. DSOD engineers and engineering geologists review and approve plans and specifications for the design of dams and oversee their construction to ensure compliance with the approved plans and specifications. Geologic and seismic reviews include site geology, seismic setting, geologic/geotechnical site investigations, construction material evaluation, and seismic dam stability. In addition, DSOD engineers inspect existing dams on a yearly schedule to ensure they are performing and being maintained in a safe manner. DSOD geologists and engineers reviewed the SFPUC's Geotechnical Investigation Work Plan (URS 2005c) and would provide oversight during the final geologic/geotechnical investigation that is required to complete the characterization of soil and bedrock at the dam site and borrow areas (URS 2005c, p. 1-1).

Regional Water Quality Control Board

As discussed in Section 4.7, Water Quality, although administered by the U.S. Environmental Protection Agency, the San Francisco Bay Regional Water Quality Control Board (RWQCB) along with the State Water Resources Control Board oversees regulation of discharge of waste into waters of the U.S. and state through National Pollutant Discharge Elimination System (NPDES) permits (Clean Water Act Section 402) and waste discharge requirements. The

RWQCB also requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared as part of the NPDES requirement before construction begins. Issues related to discharge of eroded soil, naturally occurring asbestos, and metals will be addressed in these permits.

SFPUC Alameda Watershed Management Plan

The *Alameda Watershed Management Plan* policies related to seismic hazards are presented below:

- Policy S7: Require adequate seismic and static geohazards engineering studies for proposed facilities, infrastructure, and utilities easements within the watershed.
- Policy S8: Require that utility pipelines within the watershed meet current seismic standards and comply with applicable hazardous materials regulations.

SFPUC General Seismic Design Requirements

In furtherance of *Alameda Watershed Management Plan* policies related to seismic hazards, the SFPUC established the *General Seismic Design Requirements* (SFPUC 2006) implementing consistent criteria for the design and retrofit of all facilities and components of the regional water system. These design requirements require that every water system improvement project must have project-specific design criteria based on the local seismic environment and the importance of the subject facility to achieve the water service delivery goals in the event of a major earthquake. A major earthquake is identified in the *General Seismic Design Requirements* as an earthquake of Richter magnitude 7.8 or larger on the San Andreas Fault, 7.1 or larger on the Hayward Fault, or 6.8 or larger on the Calaveras Fault. The design criteria are based on standard industry practices, codes, and standards, but exceed these requirements for facilities that are located in a severe seismic environment and are needed to achieve water system delivery goals. The Calaveras Dam is also under the jurisdiction of the DSOD and may be subject to additional design requirements and seismic hazard evaluation methodology (discussed above).

Under these design requirements, each facility is evaluated for its necessity in meeting the water service delivery goals and assigned a seismic performance class for the purposes of determining appropriate seismic design criteria. Facilities needed to achieve a basic level of service within 24 hours of a major earthquake are assigned a seismic performance class of Critical, and the Calaveras Dam is classified as Critical.

4.8.2 IMPACTS

4.8.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to geology, soils, and seismicity, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state geologist for the area or based on other substantial evidence of a known fault (refer to Division of Mines and Geology Special Publication 42);
 - Strong seismic ground shaking;
 - Seismic-related ground failure, including liquefaction; or
 - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic or soil unit that is unstable, or that would become unstable as a result of the project, and potentially result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive or corrosive soil, creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or
- Substantially change the topography or any unique geologic or physical features of the site.

The project would not include construction of septic tanks or other wastewater systems. Therefore, it would not be affected by soils incapable of supporting any wastewater systems, and this topic will not be discussed further.

4.8.2.2 APPROACH TO ANALYSIS

The CDRP has been designed in accordance with the SFPUC's *General Seismic Design Requirements* (described above in the Setting discussion), which require a site-specific investigation and development of project-specific design criteria based on site-specific geologic and seismic hazards, including fault rupture, ground motions generated by earthquakes (ground shaking), slope instability, liquefaction, and loss of soil strength. Presence of corrosive soil has been added to the significance criteria in order to address this potential impact at the dam and spillway sites. Corrosive soil can affect concrete and unprotected steel, potentially leading to failure of these materials. The proposed design has been conducted under the scrutiny and critical

review of the Calaveras Technical Advisory Panel (CTAP), which is a group of recognized experts in earth dam construction.⁴ The CTAP provides confirmation to the SFPUC that the proposed design of the replacement dam is in accordance with the criteria and requirements of the DSOD. As such, the evaluation of whether the replacement dam will pose a seismic risk takes into account SFPUC's General Seismic Design Requirements, DSOD requirements, and CTAP confirmation of the application of those requirements to the design.

4.8.2.3 PROJECT IMPACTS

Table 4.8.5 summarizes the project-related impacts on geology, soils and seismicity described in this section.

Table 4.8.5: Summary of Geology, Soils, and Seismicity Impacts

Impact	Level of Significance
4.8.1: Landslide activation as a result of construction activities, resulting in structural damage and injuries.	LS
4.8.2: Impacts of excavation, placement of fill, and other construction activities on soils with severe erosion and slope instability hazards.	LSM
4.8.3: Impacts on slopes at the disposal sites due to fill settlement, slippage, and failure under seismic loading.	LSM
4.8.4: Seismic hazards at the replacement dam.	LS
4.8.5: Hazards of seismically induced ground failure, including liquefaction, lateral spreading, and settlement at disposal fill sites.	LSM
4.8.6: Impacts on project structures and buried utilities from expansive or corrosive soils.	LS
4.8.7: Induced seismic activity from reservoir refilling.	LS
4.8.8: Alteration of the existing topography and geologic features of the site.	LS
<i>Notes:</i> LS – Less than significant LSM – Less than significant with mitigation	

Impact 4.8.1: Landslide activation as a result of construction activities, resulting in structural damage and injuries.

Destabilization of landslides or natural slopes could occur as a result of construction activities due to excavation and/or grading operations at the dam site, spillway, and borrow sites, but could also be triggered during earthquakes. Excavations for the temporary access roads, staging areas, and disposal sites could result in new slope instability or potentially trigger existing landslides. Slope failures are more likely to occur in areas with a history of previous failure and in weak geologic

⁴ Members of the CTAP are Dr. Clarence Allen, Dr. I. M. Idriss, Eric Kollgaard, Alan O'Neill, and Dr. John J. Cassidy.

units exposed on unfavorable slopes. Slope failures could cause injuries and/or damage nearby facilities and properties.

One large landslide has been mapped approximately 2,000 feet downstream of the downstream toe of the proposed dam. This landslide is sufficiently separated from the work area that it would not be expected to affect, or be affected by, the project.

The most important landslide relative to the project is the right abutment landslide. This landslide is located approximately 400 feet downstream of the existing dam. It is 300 to 400 feet wide and approximately 1,200 feet long, with a vertical height of approximately 400 feet. Geologic studies indicate that the landslide material is approximately 35 feet deep and lies on *mélange* and serpentinite bedrock. Excavation of the dam foundation would cause movement of this landslide; therefore, the SFPUC has proposed a two-phased program to stabilize the landslide in the first stage of project construction, which would reduce the risk of failure to a less-than-significant hazard to the dam and workers (URS 2006b). Phase 1 stabilization would consist of a soldier pile tie-back wall and Phase 2 stabilization would be placement of a compacted buttress fill. Potential for movement of the landslide would be monitored with inclinometers during construction. In addition, long-term monitoring would be performed following completion of the final buttress.

Several smaller landslides are mapped above and immediately downgradient of the right abutment. Excavation and grading for the new dam would remove the landslide deposits that lie within the dam foundation footprint. The adjacent downgradient landslides display direction of movement away from the dam site (i.e., north and northwest) and would not affect the dam site or foundation excavation. Consequently, these smaller landslides require no further investigation or stabilization.

Portions of the remainder of the project areas (access roads, haul roads, and disposal sites) are underlain by materials that may also generate small landslides. These small landslides would not be expected to cause injuries to people or affect project components.

Impact Conclusion

The potential impact related to slope instability from existing landslides is significant only for the dam site. Site-specific geotechnical investigations to assess the landslide hazards have been completed and appropriate design to repair identified instability problems that would have endangered people or affected the project components has been incorporated in the final project design. Thus, the project as designed would have a less-than-significant impact related to potential landslide hazards.

Impact 4.8.2: Impacts of excavation, placement of fill, and other construction activities on soils with severe erosion and slope instability hazards.

Most of the project elements are underlain by soils classified as having moderate to severe hazard of erosion. Construction activities such as grading and excavation, stockpiling, and transport would remove stabilizing vegetation and expose areas of loose soil that, if not properly stabilized, would be subject to soil loss and erosion by wind and stormwater runoff. Newly constructed and compacted engineered slopes would also undergo substantial erosion through dispersed sheet flow runoff, and more concentrated runoff can result in the formation of erosional channels and larger gullies, each compromising the integrity of the slope and resulting in significant soil loss.

Excavation and preparation of the dam foundation area and grading of access roads and disposal sites would be subject to substantial soil loss and erosion by wind and stormwater runoff. Temporary and permanent access roads, haul roads, and disposal sites could be subject to soil loss and erosion by wind and stormwater runoff.

Two borrow areas, Borrow Area B and Borrow Area E, are proposed as part of the dam replacement project (URS 2007a) and are discussed below.

Borrow Area B is located northeast of Observation Hill in an area of moderate to steep slopes that descend to Calaveras Creek. Both soft and hard rock materials would be removed from the Temblor Sandstone and Franciscan blueschist, mélangé and greywacke bedrock at this site. Considering the moderate to steep existing slopes in Borrow Area B, excavation will readily increase erosion impacts, including sediment-laden discharges to Calaveras Creek that will require implementation of a carefully planned SWPPP and robust application of best management practices (BMPs) for the protection of water quality and natural resources (for a detailed description of BMPs, see Mitigation Measure 5.7.1, Stormwater Pollution Prevention Plan). The final slope inclination is planned to be 0.5:1 (horizontal to vertical) with a gently sloping floor that would drain toward Calaveras Creek. The steep slope would be excavated with benches and stabilized for safety. The benches would control runoff, although the consolidated bedrock exposed in the slope and floor would not be prone to excessive erosion.

Excavation at Borrow Area E at the south end of the Calaveras Reservoir would remove sandy to silty lean clay with gravel from the alluvial deposits. The materials likely exceed the actual depth of exploration, 20 feet (URS 2005a). The actual excavation limits would extend into the reservoir proper when it is refilled to Elevation 756 feet. The excavation side slopes would be cut to gentle inclinations (3:1), benched and revegetated to prevent slope stability concerns and mitigate erosion. Much of the excavation would be very near existing drainage courses and proper SWPPPs would be required to prevent runoff during the construction rainy season. Standard measures such as the use of berms, straw wattles, silt fences, seasonal hydroseeding, and durable protective covers would be required, although subject to revision by the final SWPPP for the

project. A portion of Borrow Area E is being considered for placement of unsuitable and excess material (Disposal Site 5) (URS 2006c). Consequently, the final drainage and restoration plan would be based on the final site configuration (excavation, original grade, or fill).

Two disposal areas, Disposal Sites 3 and 7, require grading of steep slopes to prepare the site and the placement of the fill. Both sites are located directly at the edge of the reservoir, and any discharges of soil would be deposited into that water body. Proposed erosion protection measures including benching and surface water ditches would be incorporated into the final grading to prevent erosion and promote revegetation of the slopes. The final grade of the site would be recontoured to allow for restoration with special vegetation (riparian and transitional wetland plants) and by hydroseeding with a native grassland seed mixture to control erosion (URS 2008a).

Erosion is a common construction-related occurrence, especially during wintertime construction projects. Excavation on steep slopes, placement of fill, and other construction activities would expose soils to severe erosion, which would be a significant impact.

Impact Conclusion

Implementation of the soil erosion protection measures discussed in Section 4.7, Water Quality, and described in detail in Mitigation Measure 5.7.1, Stormwater Pollution Prevention Plan, during construction and development and implementation of post-construction soil stabilization and revegetation plans, would reduce this impact to a less-than-significant level.

Impact 4.8.3: Impacts on slopes at the disposal sites due to fill settlement, slippage, and failure under seismic loading.

An estimated 3.8 million cubic yards of excess and unsuitable material would require disposal outside the limits of the proposed replacement dam and spillway. Eight disposal sites have been evaluated, and the best four sites have been proposed as part of the project (URS 2006c and 2008b), but only preliminary design of the disposal site fills has been carried out. If not properly designed, the disposal site fills could result in significant impacts on the environment due to settlement, slip out of steep embankments, or failure under seismic loading.

Disposal Sites 2, 3, and 7 would receive materials during three different construction seasons depending on staging and actual disposal volumes. Disposal Site 3 is the largest and is estimated to accommodate up to 2.48 million cubic yards in the drainage west of the existing dam and would be constructed across the Gully Fault. As noted, this fault is a conditionally active fault. The westerly edge of the fill would be located close to the active Calaveras Fault. Thus, a fault rupture hazard exists at Disposal Site 3. The final surface of Disposal Site 3 would be a graded slope that ascends from Elevation 700 feet on the west and rises to Elevation 960 feet along the existing access road to Calaveras Dam (southwest flank of Observation Hill). The final slope would be predominantly graded at an inclination of approximately 4:1 (horizontal to vertical)

although locally as steep as 2:1 at the reservoir margin where a rockfill dike would be constructed. This slope inclination, length and height, and location adjacent to the reservoir would be described in a grading plan that specifies site preparation, compaction, subsurface and surface drainage measures, final preparation of the finished surface, and a landscape or revegetation plan to control slope stability and erosion.

Disposal Site 7 has an estimated capacity of 1.06 million cubic yards and is located at Corral Point (east side of reservoir, 3,500 feet south of existing dam). The fill would be placed across the inactive Corral Point Fault in a shallow valley between a small hill on the west side and a taller hill on the east side. Maximum fill thickness would be about 100 feet. Disposal Site 7 is underlain by Franciscan serpentinite and greenstone and avoids the landslides mapped to the north and south (URS 2005a).

A geotechnical analysis was conducted for Disposal Sites 3 and 7 and concluded that the proposed fill slopes at these sites would be geotechnically stable (static and dynamic) if the spoil materials are lightly compacted, natural seeps are intercepted by gravel drains, existing landslides are removed prior to fill placement, and the rockfill dike buttress is placed at the reservoir margin for Disposal Site 3 (URS 2008a). The SFPUC has incorporated these recommendations into the final design plans for the CDRP. In addition, a 4-foot-thick Temblor Sandstone cap would be placed over the final surface to prevent exposure of any NOA material due to fault rupture and displacement of the fill along the Corral Point, Calaveras, and Gully Faults (URS 2008a).

Disposal Site 2 is between the new and existing dams and would receive about 470,000 cubic yards. The fill would have an upper flat surface at Elevation 650 feet. The fill would be buttressed by the old and new dams (URS 2007b), would be submerged beneath the reservoir, and would have a rockfill cover. Consequently, there are no hazards related to stability of the fill and slopes or erosion potential.

Disposal Site 5 is located within the limits of Borrow Area E at the south end of Calaveras Reservoir and has an estimated capacity of 0.84 million cubic yards. Disposal Site 5 is intended to be used only for supplemental disposal capacity, if necessary, and could only be used during the second construction season to accommodate sequencing and construction of the dam core. The original grade and gentle north-draining slope would be re-created (URS 2008b). A geotechnical investigation has not been undertaken for the reserve Disposal Site 5, and placement of fill at this site unless properly engineered could create a significant slope failure hazard. Therefore, Mitigation Measure 5.8.3, identified in Chapter 5, requires a site-specific geotechnical evaluation to be conducted to support the civil engineering design to ensure stability of fill placed at Disposal Site 5, if this reserve disposal site is used for the CDRP. The geotechnical investigation and analysis would be conducted under the oversight of a California-licensed geotechnical engineer. The results of the investigation and analysis would provide

recommendations for final design. The design would include specifications for standard grading practices for site preparation, construction of underdrains, compaction, and creation of benches and surface drains to control erosion. Implementation of this mitigation measure would reduce this impact to a less-than-significant level.

The disposal area fills may be subject to settlement, differential settlement, erosion, and seismic-induced failure. Benches, revegetation and surface drainage control measures would control erosion of the completed disposal sites and such a failure at any of the disposal sites may pose minimal hazards to humans as no structures would be built in these areas. However, a failure could result in other impacts on the environment such as effects on sensitive habitats, fish and aquatic environments, areas for which restoration is planned, discharges of sediment into the reservoir, temporary problems in treating turbid water at the Sunol Valley Water Treatment Plant and costly repairs. As such, the potential impact of slope settlement, slippage and failure would be a significant impact.

Impact Conclusion

Because Disposal Site 2 would be buttressed by the old and new dams, submerged beneath the reservoir, and would have a rockfill cover, there would no slope stability hazards associated with this site. Geotechnical evaluations have been completed for Disposal Sites 3 and 7 that address static stability, hazards from fault offset, and grading requirements. The SFPUC has incorporated the recommendations from these evaluations into the final design for these disposal sites. Therefore, potential slope failure hazards at Disposal Sites 3 and 7 would be less than significant. If reserve Disposal Site 5 is used for the CDRP, a site-specific geotechnical evaluation would be conducted to ensure the stability of fill placed at this site, as addressed in Mitigation Measure 5.8.3. Implementation of this mitigation measure would reduce potential slope stability hazards associated with the use of Disposal Site 5 to a less-than-significant level.

Impact 4.8.4: Seismic hazards at the replacement dam.

One of the purposes of the proposed project is to improve the seismic reliability of the SFPUC water conveyance and storage system in the East Bay area. The following discussion is provided to identify how the proposed project would reduce the existing seismic hazard.

Proposed Dam Site Foundation and Landslide Hazard

The strength and hydraulic conductivity of the bedrock below the dam is critical to achieve the required foundation support. Proposed excavation and removal of the upper 100 feet of Temblor Sandstone and 40 to 80 feet of the Franciscan Complex is necessary to key the dam embankment into less fractured, higher strength rock with low hydraulic conductivities. Several small and one large landslide on the right abutment would be removed by the planned 75-foot-deep foundation

excavation. Another large landslide located downstream of the replacement dam would remain (URS 2006a, p. 4-2), but it would pose no hazard to the new dam because it is outside the dam footprint.

Surface Fault Rupture

The Calaveras Fault zone (as mapped by the Alquist-Priolo program) is located about 1,600 feet west of the proposed replacement dam. The proposed dam site is not crossed by any active fault zones. Thus, there would be no hazard of dam failure resulting from ground displacement on the main trace of the Calaveras Fault.

The only component of the proposed project that would cross an active fault is the proposed permanent and temporary access roads between Calaveras Road and the dam and reservoir area. These would not be public roads. According to the Alquist-Priolo Earthquake Fault Zoning Act, construction of a structure for human occupancy within 50 feet of the trace of a known active fault is prohibited. A road is not a structure considered to have prohibitive vulnerability to seismic hazards. Damage to the road would not impair the dam and its operation.

Ground rupture most commonly occurs along preexisting faults, which are zones of weakness, but can also occur slowly as fault creep or more suddenly as earthquakes. Where rupture occurs near buildings or other facilities, there is a potential for injury to persons and significant economic loss due to structural damage. There is potential for the proposed reservoir rim to experience fault rupture due to co-seismic movement on one or more of the two active faults crossing the reservoir rim. While this may result in local displacement on the rim and waves in the reservoir, it likely would not pose any hazard to the dam itself. Because the proposed dam would meet DSOD seismic criteria of avoiding active faults and the SFPUC seismic design requirements, the impacts related to fault rupture are less than significant for this project.

Seismically-Induced Ground Shaking

Ground shaking is the most widespread effect of earthquakes and poses a greater seismic threat to the project than local ground rupture. Depending on the level of ground movement, an earthquake could damage buildings, pipelines, valves, inlet and outlet structures, and the dam, resulting in a disruption of water service and/or endangering the health and welfare of persons. Such damage could require short-term, temporary service interruptions in order to inspect and repair the damage, and long-term repairs could also be required. With the new structural design of the dam and appurtenances meeting current seismic design codes (SFPUC and DSOD), the loss of some operational functions related to an earthquake would have substantially reduced probability of occurrence and severity than would occur at the existing dam in the aftermath of a similar large earthquake.

Improved Stability and Seismic Response

Active and potentially active faults capable of producing strong ground shaking are located near the project. Most notable of these are the San Andreas, Hayward and Calaveras Faults. The proposed Calaveras Dam and the related facilities could experience strong ground shaking from an earthquake on one of these faults. Anticipated ground shaking has been considered in developing the seismic design criteria for the final design in order to meet one of the key objectives of the project (URS 2005d). The SFPUC would be required to design the project in accordance with current seismic criteria, including those of the CBC, DSOD and SFPUC, which are specifically established to prevent a failure of the dam during earthquakes. While the dam could be damaged by a major earthquake on the Calaveras Fault, the replacement dam is being designed to remain operational after a major earthquake and must meet current DSOD seismic response requirements.

Proposed dam safety features include a design using seismic parameters developed by the design engineers under the scrutiny of the CTAP and reviewed by the DSOD (URS 2005d), a robust dam section and profile compatible with future dam enlargement, minimum factors of safety, and performance criteria that require the dam, spillway, crest, and outlet works to remain functional after the design earthquake (URS 2006a). The replacement dam would use the earth embankment scheme consisting of six zones of earth materials specifically selected and placed to provide seepage barriers, drains, filters and protection (see Section 3.4, Proposed Project Elements, in Chapter 3, Project Description). The embankment itself would be constructed on a specially prepared foundation that removes all unconsolidated deposits and weathered bedrock such that the dam core and filter zones are founded on slightly weathered to fresh bedrock. The exposed bedrock would be grouted to fill discontinuities (foliation, shears, fractures, joints) (URS 2006a). The foundation excavation is estimated to be 40 to 80 feet deep in Franciscan Complex rock (channel area and east abutment) and nearly 100 feet below ground surface in the Temblor Sandstone (left [west] abutment).

The foundation treatment also includes a seepage cutoff created by drilling and grouting closely spaced holes resulting in a two-line grout curtain (URS 2006a). Along the alignment of the grout curtain a 10-foot-deep concrete cutoff wall would cap the curtain and act as a seepage barrier to shallow depths directly below the foundation surface (URS 2006a). The low permeability of the clay core (Zone 1) would provide a barrier to limit seepage through the dam. Sand is proposed to form chimney and blanket filters (Zone 2), gravel is proposed for chimney and blanket drain (Zone 3), and rockfill (Zone 5) would be used as part of the blanket drain. The filter zones would prevent piping of the core and foundation, and the drains would collect and drain seepage on the downstream side of the core and from the downstream foundation. The seepage would be directed to the channel downstream of the dam. It should be noted that seepage and seepage

discharge is a normal and expected condition for dams and the design would accommodate that expectation to ensure that the seepage does not impair the stability in any way.

The shell (Zones 4 and 5) would be constructed on both sides of the core and forms the large embankment structure of the dam. Finally, a riprap layer (Zone 6) is proposed to be placed on the upstream face of the dam to prevent wave erosion and protect the Zone 5 embankment materials.

The factor of safety for the dam design would exceed the criteria for all loading conditions related to steady state seepage and rapid drawdown effects, as well as criteria for response to seismic loads. The dam is designed to accommodate deformations including crest settlement of less than 4 feet during the Maximum Credible Earthquake and estimated maximum settlement between 1.5 and 3.0 feet. Given a design freeboard of about 16 feet, the estimated crest settlement would not result in overtopping of the dam. With the design parameters, the dam would be expected to remain stable after the Maximum Credible Earthquake on the nearby Calaveras Fault. Estimated horizontal displacements in such an earthquake would be no greater than 3 feet in the near-surface upstream slope and less than 2 feet in the downstream slope; these displacements are substantially less than the proposed thickness of the filter and drain zones.

Another safety feature would include the installation of instrumentation within the dam embankment, foundation, downstream of the dam, and the right abutment landslide (URS 2006a). The instruments are intended to measure physical parameters such as deformation, seepage flows, piezometric levels, pore pressure, and seismic response. The instrumentation data would be used to monitor the dam performance during construction, reservoir filling, and long-term monitoring of the dam's performance (URS 2006a).

The consolidated bedrock at the dam site and along the reservoir rim is not prone to liquefaction or seismically-induced settlement. The proposed dam foundation would be supported directly on bedrock following removal of the unconsolidated soil, alluvium, landslide debris, and weathered rock, and therefore the dam would not be subject to failure from liquefaction. In addition, the dam would be constructed using properly compacted earth materials and drainage systems, such that the embankment itself would not be prone to liquefaction.

Impact Conclusion

Overall, based on the seismic criteria used in the design of the replacement dam, failure is not expected to result from a major earthquake. The proposed replacement dam would be designed to remain stable and functional following a major earthquake on the Calaveras Fault or regional earthquakes generated on other faults (e.g., the San Andreas Fault and Hayward Fault). As such, the Calaveras replacement dam would meet the DSOD requirements. Therefore, seismic hazard impacts would be less than significant.

Impact 4.8.5: Hazards of seismically induced ground failure, including liquefaction, lateral spreading, and settlement at disposal fill sites.

Liquefaction-related phenomena can include lateral spreading, ground oscillation, loss of bearing strength, subsidence, and buoyancy effects, all of which could cause damage to project structures. During loss of bearing capacity, large deformations can occur within the soil mass. Damage from liquefaction and lateral spreading is generally most severe when liquefaction occurs within 15 to 20 feet of the ground surface. Foundations for structures, vaults, and pipelines are most likely to suffer damage from liquefaction-related phenomena.

The proposed dam would not be subject to liquefaction. Geotechnical data from Borrow Area E (URS 2006c) indicate that the alluvial deposits are mostly clays and sandy clays and are not liquefiable. If Disposal Site 5 is used, the materials placed there would include excess materials from spillway excavation, material dredged for a barge access channel, or rockfill materials from construction of the barge loading facility. These disposal materials, consisting principally of coarse rock, would not be subject to liquefaction or lateral spreading. Disposal Sites 3 and 7 would be underlain by bedrock, and therefore would not be subject to liquefaction. Disposal Site 2 would be submerged and would be contained on its sides by the cofferdam and new replacement dam.

Seismically-induced settlement can occur in areas underlain by compressible sediments. Stream channel deposits and recent valley alluvium are generally the most susceptible to earthquake-induced settlement. At the CDRP site, these materials are found at the mouth of Calaveras Creek where it enters the reservoir. However, no structures are planned at this location. Additionally, some artificial fills are susceptible to mobilization and densification, resulting in earthquake-induced subsidence. There are no existing artificial fills at the project site.

As discussed above, geotechnical analysis was conducted for Disposal Sites 3 and 7 and concluded that the proposed fill slopes at these sites would be geotechnically stable (static and dynamic) if the spoil materials are lightly compacted, natural seeps are intercepted by gravel drains, existing landslides are removed prior to fill placement, and the rockfill dike buttress is placed at the reservoir margin for Disposal Site 3 (URS 2008a). The SFPUC has incorporated these recommendations into the final design plans for the CDRP, and no structures are proposed to be located on or adjacent to the disposal site fills. As such, potential impacts from seismically-induced settlement or subsidence of fill placed at Disposal Sites 3 and 7 would be less than significant.

Disposal Site 2 is between the new and existing dams and would receive about 470,000 cubic yards. The fill would have an upper flat surface at Elevation 650 feet. The fill would be buttressed by the old and new dams (URS 2007b), would be submerged beneath the reservoir,

and would have a rockfill cover. Therefore, the placement of fill at Disposal Site 2 would have no impacts due to seismically induced settlement or subsidence.

As stated above, Disposal Site 5 is intended to be used only for supplemental disposal capacity, if necessary. A geotechnical investigation has not been undertaken for Disposal Site 5, and Mitigation Measure 5.8.3, identified in Chapter 5 requires a site-specific geotechnical evaluation to be conducted to support the civil engineering design to ensure stability of fill placed at Disposal Site 5 if this site is used for the CDRP. In addition, no structures are proposed to be constructed on or adjacent to Disposal Site 5. Therefore, with the implementation of Mitigation Measure 5.8.3, potential impacts from seismically induced settlement or subsidence of fill placed at Disposal Site 5 would be less than significant.

Impact Conclusion

As described above, the replacement dam and the proposed disposal fills would not be subject to liquefaction. The placement of fill at Disposal Site 2 would have no impacts due to seismically induced settlement or subsidence. Settlement and seismically-induced subsidence at Disposal Sites 3 and 7 would be prevented by incorporating site-specific geotechnical investigations conducted for these sites into the final design of the fills. Mitigation Measure 5.8.3, identified in Chapter 5, describes the site-specific geotechnical evaluation necessary to support the civil engineering design to ensure stability of Disposal Site 5 if this site is used for the project. Implementation of this mitigation measure would reduce potential impacts due to seismically induced settlement or subsidence at Disposal Site 5 to a less-than-significant level.

Impact 4.8.6: Impacts on project structures and buried utilities from expansive or corrosive soils.

Problematic soils, including corrosive and expansive soils, can cause damage to structures and buried utilities, and can also increase required maintenance. Underground pipes and structures damaged by corrosion could reduce the operation of the reservoir and require costly replacement.

Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and bare-metal structures exposed to these soils can deteriorate, eventually leading to structural failures. Expansion and contraction of expansive soils in response to changes in moisture content can cause differential and cyclical movements that can cause damage and/or distress to structures and equipment. The natural soil types identified within the dam and spillway area and disposal sites are known to be moderately corrosive and potentially expansive. The chemical character of the underlying bedrock related to corrosion concerns is not known. The corrosion potential of soil or bedrock is a concern for concrete and unprotected steel at the dam and spillway. The special foundation area improvements for a dam (stripping of soil to a bedrock surface) would eliminate this potential for expansive and corrosive soil to affect the dam

and spillway. Expansive soil would be removed beneath temporary access roads and the disposal sites and therefore would not significantly impair the intended use of these facilities.

Impact Conclusion

Compliance with standard design and construction practices for the determination of the corrosive characteristic and expansion potential of soils employed during design for dams, steel pipelines and concrete facilities, such as protection of steel with coatings, and use of corrosion-resistant concrete, would ensure that expansive or corrosive soil impacts would be less than significant.

Impact 4.8.7: Induced seismic activity from reservoir refilling.

Reservoir-triggered seismicity is the phenomenon observed during and after filling of large reservoirs in which there is an increased frequency of earthquakes in the vicinity. The cause is likely the additional load or stress caused by the weight of the impounded water and consequently the most common occurrence of reservoir-triggered seismicity is associated with large and deep reservoirs. Reservoir filling and subsequent operation at the pre-DSOD restricted Calaveras Reservoir maximum level (756 feet) is unlikely to trigger seismicity because the local tectonic and hydrologic regime beneath the impoundment has reached equilibrium following the original reservoir filling (URS 2005d). Additionally, there are no data that indicate that the historic operation of the reservoir was correlated with local seismic activity.

Impact Conclusion

This impact would be considered less than significant.

Impact 4.8.8: Alteration of the existing topography and geologic features of the site.

The project would use two designated borrow areas as well as excavation of the spillway to obtain earth and rock materials for construction of the dam and two disposal sites for excess and unusable material. Borrow Area B is located downstream of the replacement dam on the west side of Calaveras Creek and encompasses a former quarry site used for the original dam construction. The excavation would create a steep backcut slope inclined at 63 degrees and measuring 160 to 180 feet high. The east-facing slope would descend to a gently north-sloping bench that would measure 100 to 350 feet wide. The excavation limits would remain 50 to 150 feet west of and 25 feet above Calaveras Creek. The backcut slope would be a uniform planar slope unlike the existing natural slopes. The floor of the borrow site would measure 900 feet long and would be atypical of the hillside topography in the area.

Borrow Area E, located at the south end of the reservoir, would create a moderate slope (18 degrees) measuring up to 25 feet high at the south end. The base of the excavation would measure 1,400 feet wide by 2,000 feet long and slope gently (about 1 degree) north toward the

reservoir. Except for the modest backcut slope, the planned excavation is comparable to the existing topography consisting of a uniform gentle north-sloping alluvial fan. During high water levels, most of Borrow Area E would be inundated by the reservoir.

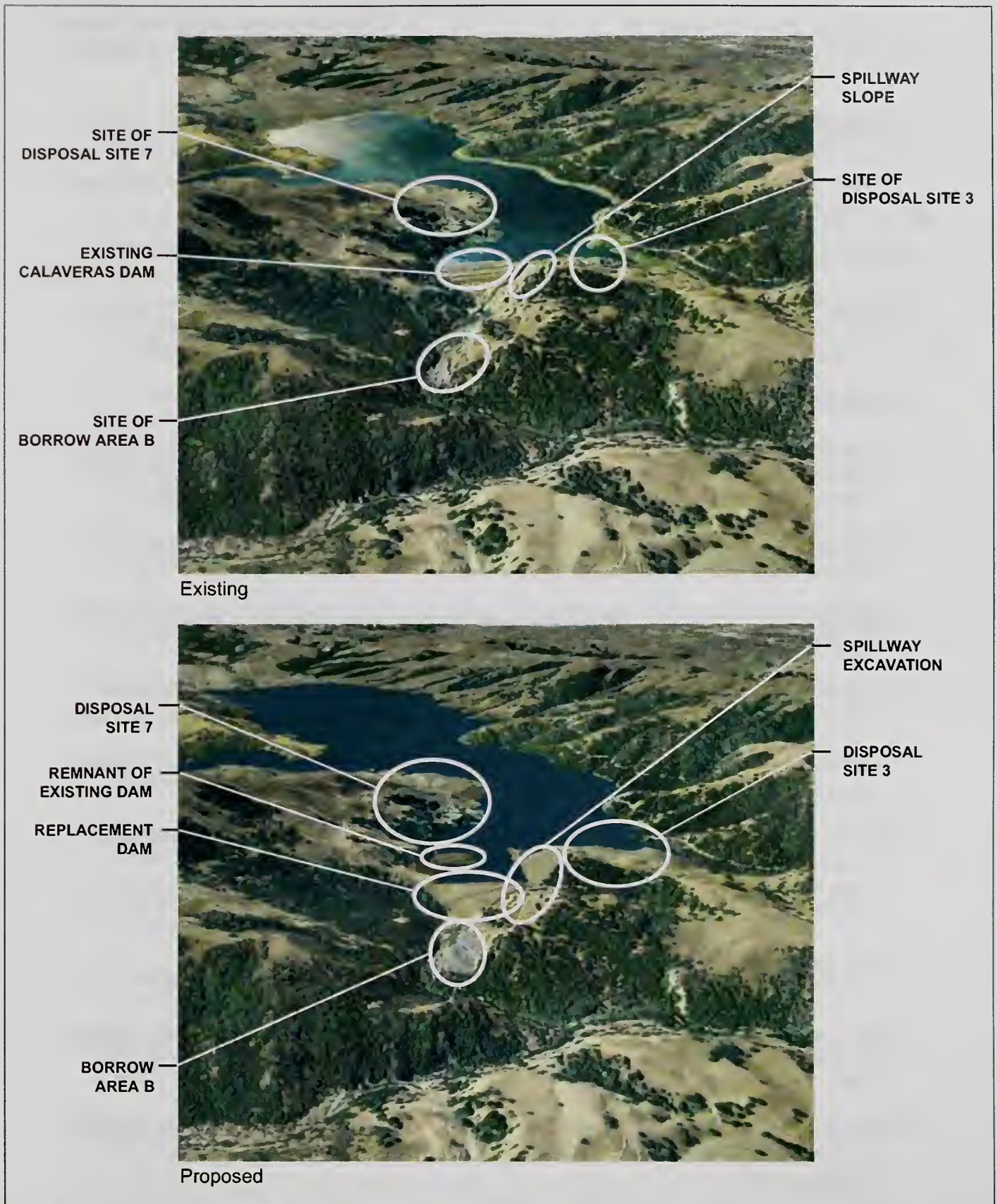
Disposal Site 3 would create a side hill fill partly filling a small south-draining valley located west of the existing dam. The fill area would measure approximately 2,000 feet long parallel to the valley and 800 to 1,200 feet wide. The fill area would extend south from Calaveras Road to near the edge of the reservoir where a 50-foot-high rockfill retention dike would support and protect the toe of the fill. The final surface of the fill would slope southwest at an inclination of 14 degrees comparable to the existing natural slope. The existing valley bottom would be filled to depths of 30 feet at the southern end and decrease to depths of 10 feet near Calaveras Road, effectively shifting the valley bottom 50 to 200 feet to the southwest.

Disposal Site 7 is located on the east side of the reservoir at Corral Point. The fill would be placed in a small valley and extend north as a side hill fill reaching the reservoir rim. The upper surface of the fill would be a level terrace measuring about 300 to 600 feet wide and 1,300 feet long. The northwest-facing fill slope would descend at an inclination of 18 degrees, comparable to the natural slopes in the area. The level terrace created at Disposal Site 7 would be flatter than the natural contours of hills in the area.

These topographic changes are shown in Figure 4.8.3: Changes in Topography. The figure shows the existing dam and reservoir in the top picture. The lower picture shows a simulation from the same perspective of the completed replacement dam with materials removed from the borrow sites and excess materials placed in disposal areas, and the reservoir water level returned to pre-DSOD restricted levels. The amounts of materials removed from borrow areas and volumes of fill in disposal areas would be large (see Tables 3.3 and 3.4 in Chapter 3, Project Description.) The altered terrain of Disposal Sites 3 and 7 would appear as broad open grasslands, once vegetation matured, similar to other areas in the surrounding terrain on the north, east, and south sides of the reservoir. The altered terrain of the cut slopes above the spillway and at Borrow Area B would expand the cut slopes currently present above the existing spillway and Borrow Area B. Thus, the anticipated changes, while large in area, would appear similar to existing topography and would function much the same as at present.

Impact Conclusion

Although the excavation and grading at the borrow areas and disposal sites would alter the existing topography, no unique geologic or topographic feature would be altered or destroyed. The very steep and uniform slope of the back cut at Borrow Area B would expand the steep slopes already present at the former borrow site. Borrow Area E and Disposal Sites 3 and 7 would partly mimic the existing slopes. Therefore, this impact would be less than significant.



SOURCE: URS

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.8.3: CHANGES IN TOPOGRAPHY

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4.9 HAZARDS AND HAZARDOUS MATERIALS

Section 4.9 Contents	
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4.9.1.1	Existing Uses of Hazardous Materials
4.9.1.2	Existing Naturally Occurring Asbestos and Metals
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4.9.2.1	Significance Criteria
4.9.2.2	Approach to Analysis
4.9.2.3	Project Impacts

This section describes the hazards and hazardous materials at and in the vicinity of the project site, hazardous materials to be used during project construction and operation and wildfire hazards during construction. The Setting subsection presents existing conditions and the regulatory framework. The Impacts subsection presents the approach and methodology for the assessment; defines the significance criteria applied to the analysis; and evaluates the potential impacts of the proposed project in regard to hazards and hazardous materials.

4.9.1 SETTING

Hazardous materials, defined in Section 25501(h) of the California Health and Safety Code (CHSC), are materials that, because of their quantity, concentration, or physical or chemical characteristics, pose a substantial present or potential hazard to human health and safety or to the environment if released to the workplace or environment. Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications, as well as in residential areas to a limited extent.

The existing potential sources of hazardous materials in the project area are:

- Existing use of hazardous materials at Calaveras Dam;
- Documented soil and groundwater contamination at the former Calaveras Test Site;
- Naturally occurring asbestos (NOA)¹ and naturally occurring metals commonly found in the Franciscan mélange² and serpentinite;³ and
- Potential hazardous building materials in the support structures that would be demolished.

¹ Asbestos is a common name for a group of naturally occurring fibrous silicate minerals that are made up of thin but strong, durable fibers.

² Mélange is a mixture of rock materials of differing sizes and types typically contained within a sheared matrix.

³ Serpentinite is a rock consisting of one or more serpentine minerals formed when ultramafic rocks have been metamorphosed (ultramafic rocks are formed in high-temperature environments well below the surface of the earth), and is commonly associated with ultramafic rock along faults such as the Calaveras Fault. Serpentinite commonly contains chrysotile, an asbestiform variety of the serpentine minerals. Amphibole asbestos is also found in some forms of Franciscan formation such as blueschist.

4.9.1.1 EXISTING USES OF HAZARDOUS MATERIALS

Calaveras Reservoir is located in a rural area surrounded primarily by agricultural and recreational (Sunol Wilderness Regional Preserve [Sunol Wilderness]) land uses; the primary activity on the agricultural land is cattle grazing. Neither of these land uses is typically associated with use of large quantities of hazardous materials.

Hazardous materials stored by the San Francisco Public Utilities Commission (SFPUC) at the Calaveras Dam site include potassium permanganate used to treat water as it is discharged from the reservoir to the Sunol Valley Water Treatment Plant (SVWTP), liquid oxygen for the hypolimnetic oxygenation system, diesel fuel and gasoline kept on the site in above-ground storage tanks to operate vehicles and equipment, as well as small quantities of cleaning agents, paints, and solvents for maintenance. In addition, as described in Subsection 3.3.4.6, On-Site Water Treatment, in Chapter 3, Project Description, sodium percarbonate is used to control the growth of algae in the reservoir. When treatment through application of sodium percarbonate is ineffective in controlling algae growth, the SFPUC uses copper-based algacides as a secondary tool, including copper sulfate. Storage and disposal of these hazardous materials are subject to federal, state, and local regulations implemented through the Certified Unified Program Agency program implemented by the Alameda County Department of Environmental Health.

4.9.1.2 EXISTING NATURALLY OCCURRING ASBESTOS AND METALS

NOA, which was identified as a Toxic Air Contaminant (TAC) in 1986 by the California Air Resources Board (CARB), is present in many parts of California and is commonly associated with serpentine⁴ and ultramafic⁵ rock types in general. Chrysotile (a form of asbestos from the serpentine mineral group) and amphibole asbestos (including crocidolite) are NOA minerals that may present a human health hazard, if they become airborne. Some occurrences of serpentine and ultramafic rock are also known to have potentially elevated concentrations of naturally occurring metals such as arsenic, cobalt, copper, chromium (including hexavalent chromium), and nickel (Wilke 2000) that can also present a human health hazard, if they become airborne. In areas with rock or soil containing NOA and naturally occurring metals, construction activities such as quarrying, general grading and construction, and use of unpaved roads and driveways, may generate dust containing NOA and naturally occurring metals.

As discussed in Section 4.8, Geology, Soils, and Seismicity, Franciscan Complex serpentinite and *mélange*, rock types known to contain chrysotile asbestos, some forms of amphibole asbestos, and naturally occurring metals, are mapped within the Calaveras Fault zone, on the western side of Observation Hill, beneath the Calaveras Creek channel downstream of the existing dam at the right abutment of the existing dam, and the hillside to the east. These occurrences are shown in

⁴ See footnote 3.

⁵ Ultramafic rocks are one type of igneous rock (formed at high temperatures well below the surface of the earth) that is rich in iron and magnesium.

Figure 4.8.1, Lithology and Geologic Features of the Project Site, in Section 4.8. Serpentinite occurs as a distinct rock type, and the Franciscan mélange is comprised of a number of rock types including greywacke, serpentinite, siliceous schist, greenstone, and blueschist.

The source of the fill materials historically used in the construction of the existing dam was not well documented; however, a large portion of the fill was obtained from the southwest face of Observation Hill (Elliot 1916) in an area mapped as Franciscan Complex serpentine and mélange (Figure 4.8.1). In addition, some fill was probably obtained from materials in the vicinity of the right dam abutment where mélange is mapped. Thus, rocks containing naturally occurring asbestos are likely present in the existing dam and the materials proposed for the construction of the replacement dam.

As part of the project design, all rock types within the project site that would be disturbed during construction were analyzed for site-specific concentrations of chrysotile asbestos, amphibole asbestos, and naturally occurring metals (URS 2009a). The results of these analyses are summarized in Table 4.9.1. As indicated in this table, the rock types found to contain NOA at the project site include serpentinite, blueschist, and greenstone of the Franciscan mélange as well as colluvium,⁶ alluvium,⁷ top soil, and fill materials derived from these rock types. The mean asbestos concentration of these rock types ranges from 0.0188 percent by weight in the alluvium from Borrow Area E to 13.5 percent by weight in the blueschist. In general, the metals concentrations were highest in samples of serpentinite and top soil, and lowest in samples of Temblor Sandstone, greywacke, fill without NOA, and Borrow Area E alluvium.

4.9.1.3 EXISTING HAZARDOUS BUILDING MATERIALS

The warehouse/compressor building, permanganate building, and intake tower would be demolished under the proposed project. The intake tower was constructed prior to 1975 and may contain hazardous building materials that could present a public health risk if disturbed during an accident or during demolition or renovation. Potential hazardous building materials that may be encountered include asbestos-containing materials⁸; electrical equipment such as transformers and

⁶ Colluvium is a loose deposit of rock debris that is accumulated at the base of a cliff or slope through the action of gravity.

⁷ Alluvium consists of unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams.

⁸ Because of its physical properties, asbestos was commonly used until the 1970s as a component of numerous building materials, including use in insulation materials, shingles and siding, roofing felt, floor tiles, the mastic used to affix floor tiles to the floor, and acoustical ceiling material. Asbestos was also used in pipe gaskets, valve packing, and automotive brakes and clutches. Today, asbestos continues to be used in roofing mastic. Asbestos is a known carcinogen and may present a public health hazard if it is present and exposed in the friable (easily crumbled) form. Long-term, chronic inhalation of asbestos can cause lung diseases such as asbestosis, mesothelioma, and lung cancer.

Table 4.9.1: Summary of Asbestos and Metals Concentrations by Rock Type

Rock Type	Mean Concentration (percent weight for asbestos and milligrams per kilogram for metals)					
	Total Asbestos	Arsenic	Cobalt	Copper	Chromium	Nickel
Top Soil	3.22	11.6	374	806	60	1528
Fill with naturally occurring asbestos	1.23	8.12	235	309	51	480
Fill without naturally occurring asbestos	–	9.4	141	170	67.5	120
Colluvium with naturally occurring asbestos	1.2	11	236	351	90.8	341
Colluvium without naturally occurring asbestos	–	8.7	220	229	58.1	172
Alluvium	2.78	8.1	181	226	67	158
Temblor Sandstone	–	8.67	129	143	29.9	75.1
Blueschist (a component of Franciscan melange)	13.5	8.48	345	244	99.6	127
Greenstone (a component of Franciscan melange)	2.48	6.11	313	303	113	156
Serpentine	6.16	5.39	321	650	92	961
Graywacke (a component of Franciscan melange)	–	10.9	189	171	45.6	104
Shale	–	12.7	242	322	118	251
Siliceous schist	–	14.2	160	163	136	140
Borrow Area E alluvium	0.0188	na	na	na	na	na
<i>Notes:</i> Total Asbestos represents the total of chrysotile and amphibole asbestos. “–” indicates that either asbestos was not detected in any of the samples of that rock type or asbestos was only detected in one sample and a mean could not be calculated. “na” indicates that this rock type was not analyzed for the metal indicated						

Source: URS 2009a

fluorescent light ballasts that contain polychlorinated biphenyls (PCBs)⁹ or di (2 ethylhexyl) phthalate (DEHP)¹⁰; fluorescent lights containing mercury; and lead-based paints.¹¹

⁹ PCBs are mixtures of synthetic organic chemicals with physical properties ranging from oily liquids to waxy solids. PCBs are a known human carcinogen; they are highly toxic substances that remain persistent in the environment, accumulate in biological systems, interfere with the reproductive system, and act as immuno-suppressants. Under the Toxic Substances Control Act, the U.S. Environmental Protection Agency (USEPA) began to impose bans on PCB manufacturing and sales and on most PCB uses in 1978.

The warehouse/compressor building was constructed in 1992 and the permanganate building was constructed in 2001. Because these structures were constructed after the use of asbestos-containing materials and PCBs was discontinued in the 1970s, these hazardous building materials would not likely be encountered during demolition. However, if fluorescent lighting is being used in the warehouse/compressor building, the ballasts could contain di (2 ethylhexyl) phthalate DEHP and fluorescent light tubes in each structure would contain mercury.¹² Because these buildings are not residential, lead-based paint may have been used on the building surfaces or compressor equipment.

4.9.1.4 FORMER CALAVERAS TEST SITE

The former Calaveras Test Site at the end of Marsh Road is located near the south end of Calaveras Reservoir at an elevation of approximately 775 feet. The SFPUC leased this 3.2-acre site to various operators between 1948 and 1993; during this time, the site was used for testing and manufacturing of propellants and explosives (URS 2004). Hazardous materials used at the site include trichloroethene, tetrachloroethene, 1,1,1-trichloroethane, butane, carbon tetrachloride, acetone, Freon, methanol, naphthalene, fluorocarbons methylene chloride, potassium and ammonium perchlorate, RDX (an explosive), barium nitrate, barium carbonate, zirconium, case die penetrant, propellant, imaging powders, resins, thinners, toluene, xylenes, alcohol, silica, polymeric materials, metals, binders, diesel, gasoline, and various gases, as well as other chemicals.

Potential sources of hazardous material releases to the soil and groundwater at this site include a former 1,500-gallon underground diesel storage tank; a former burn pit; the former Building 7 drain and piping system which may have been used for disposal of chemicals; and an underground fire protection water tank that received discharges of solvents, metals, and other hazardous materials from Building 7.

¹⁰ Between 1979 and the early 1990s, DEHP was used in place of PCB as a dielectric fluid in some fluorescent light ballasts and other electrical equipment (Green Lights Recycling 2007). DEHP is classified as a probable human carcinogen by the U.S. Department of Health and Human Services and as a hazardous substance by the USEPA. Because of this, ballasts containing DEHP must be legally disposed of; ballast incineration or a combination of ballast recycling and incineration are recommended for complete destruction of DEHP.

¹¹ Lead-based paint is paint that contains lead, a heavy metal historically added to paint as pigment and to speed drying, increase durability, retain a fresh appearance, and resist moisture (which causes corrosion). Because of its toxicity, paint containing more than 0.6 percent lead was banned for residential use in 1978 by the U.S. Consumer Product Safety Commission, but continues to be used in some industrial applications. Lead is toxic to humans, particularly young children, and can cause a range of human health effects depending on the level of exposure. When adhered to the surface of a material, lead-based paint poses little health risk. Where the paint is delaminated or chipping, it can cause a potential threat to the health of young children or other building occupants who may ingest the paint. Lead dust also presents public health risks during the demolition of structures that contain lead-based paint, particularly when metal coated with paint containing lead is torch cut. Similarly, the lead concentrations of coatings applied to many types of ceramic tiles as glaze may result in exposure to workers when dust is generated by breaking the tiles. Lead-based paint that has separated from a structure and dust generated from breaking ceramic tiles may also contaminate nearby soil.

¹² Spent fluorescent lamps and tubes commonly contain mercury vapors and are considered a hazardous waste in California (California Code of Regulations [CCR], Title 22, Section 66261.50). In 2004, new regulations classified all fluorescent lamps and tubes in California as a hazardous waste, because they contain mercury. Since they are considered a hazardous waste, all fluorescent lamps and tubes must be recycled or taken to a universal waste handler.

Because a release of hazardous materials has occurred, the Calaveras Test Site is listed in the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Spills, Leaks, Investigations, and Cleanup (SLIC) database, which tracks the status of sites with documented groundwater contamination. The RWQCB has required cleanup (or remediation) of historic releases of hazardous materials at this site. Previous remedial actions include:

- Removal of the 1,500-gallon underground diesel fuel storage tank in 1987. Results of subsequent soil sampling showed no evidence of residual soil contamination.
- Removal and disposal of soil contaminated with lead from the former burn pit area in 1992. This remediation included removal of soil containing lead concentrations in excess of California hazardous waste criteria. In 2000, the RWQCB issued a letter stating that no further cleanup of this area was required.
- Removal of a septic tank and effluent tank as well as the underground fire protection water tank and associated piping in 1994. Affected soil around the underground fire protection water tank inlet was removed, but no holes or cracks were observed in the tanks and no staining was observed in the soil after tank removal.

Building 7 was demolished in 1994 as part of site closure activities. Soil samples collected at that time contained detectable concentrations of lead and volatile organic compounds including trichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and methylene chloride. As part of later sampling in 1995, trichloroethene was detected in soil samples adjacent to a former degreaser area and a former solvent storage area at depths between 2.5 and 11.5 feet below ground surface and adjacent to the former underground fire protection water tank at depths between 6.5 feet and 26.5 feet below ground surface. Trichloroethene concentrations ranged from 1.2 microgram per kilogram ($\mu\text{g}/\text{kg}$) to 81 $\mu\text{g}/\text{kg}$. Trichloroethene concentrations in surface soil samples from within the footprint of Building 7 were substantially lower than detected in 1994 (8 $\mu\text{g}/\text{kg}$ to 190 $\mu\text{g}/\text{kg}$), likely due to volatilization. The maximum lead concentration detected was 480 milligrams per kilogram (mg/kg), which could potentially exceed the California soluble threshold limit concentration (STLC) and federal toxicity regulatory level of 5 mg/kg .¹³

Trichloroethene, 1,1-dichloroethene, tetrachloroethene, methylene chloride, Freon 113, lead, and barium have been detected in the groundwater. Based on isoconcentration plots, the apparent source was the vicinity of the northern portion of the former Building 7, the former underground fire protection water tank, and the former degreaser area. However, only the concentrations of trichloroethene and 1,1-dichloroethene exceeded drinking water maximum contaminant levels (URS 2004).

¹³ In accordance with CCR Title 22, Sections 66260 through 66261.10, excavated soil is classified as a hazardous waste if it exhibits the characteristics of ignitability, corrosivity, reactivity, or toxicity. A waste is considered toxic in accordance with 22 CCR S66261.24 if it contains certain metals or organic substances at soluble concentrations greater than federal toxicity regulatory levels using a test method called the toxicity characteristic leaching procedure; or if it contains total concentrations of certain substances at concentrations greater than the total threshold limit concentration or soluble concentrations greater than the soluble threshold limit concentration.

In 1999, the RWQCB issued its final cleanup requirements for the site, approving monitored natural attenuation as the preferred remedial approach for the groundwater (RWQCB 1999). The cleanup requirements established drinking water maximum contaminant levels as cleanup levels for trichloroethene and 1,1-dichloroethene in the groundwater (5 micrograms per liter [$\mu\text{g/L}$] for trichloroethene and 6 $\mu\text{g/L}$ for 1,1-dichloroethene) and established a trigger level of 1 $\mu\text{g/L}$ of trichloroethene or 1,1-dichloroethene in Calaveras Reservoir surface water to ensure that beneficial uses of the reservoir are not degraded. In accordance with the cleanup requirements, TransTechnology Corporation and SRI International, as the primary named dischargers, are required to monitor groundwater quality annually at the site to evaluate water quality and the effectiveness of natural attenuation in reducing contaminant concentrations in the groundwater.

From 1994 through 2004, measured groundwater elevations at the former Calaveras Test Site were consistently higher than reservoir elevation, indicating groundwater flow towards the reservoir. As shown in Figure 4.9.1: Calaveras Test Site Borrow Avoidance Area, in 1996 the plume of trichloroethene identified in the groundwater at this site was estimated to extend about 730 feet to the northwest of where it originated. By 2003 the estimated length of the plume decreased to 570 feet. Although the complete downgradient extent of the plume was not identified with the existing monitoring well network, analysis of surface water samples collected downgradient from the site did not detect concentrations of volatile organic compounds (including trichloroethene and 1,1-dichloroethene) in the reservoir from 1995 to 2003.¹⁴

The groundwater flow direction is reported as generally from south to north at a very shallow gradient resulting in relatively slow groundwater movement and migration of the plume. During periods of high precipitation (1 to 2 months of the year), groundwater flows from north to south under a steeper gradient, resulting in reversal of the groundwater flow direction when water levels in the reservoir are high. This reversal of groundwater flow direction would reverse the direction of plume migration and the steeper gradient would result in higher rates of plume migration, away from the reservoir. Based on this, the annual horizontal migration of trichloroethene is reported to be essentially stagnant. This mechanism has reportedly prevented the migration of trichloroethene to Calaveras Reservoir (URS 2004, p. 3-4).

In 2004, the groundwater monitoring program was reduced to include monitoring of only the two furthest downgradient wells (MW8S-96 and MW9-96). In 2006, the concentration of trichloroethene detected in groundwater samples from these wells was 11 and 10 $\mu\text{g/L}$, respectively, which is twice the cleanup level (Conestoga-Rovers & Associates 2006). 1,1-dichloroethene was not detected in either of the groundwater samples, and has not been detected in the site groundwater since 1997. The RWQCB is prepared to recommend closure of the groundwater contamination case at this site (Johnson pers. com.).

¹⁴ With concurrence from RWQCB, water quality monitoring in Calaveras Reservoir was discontinued after 2003.

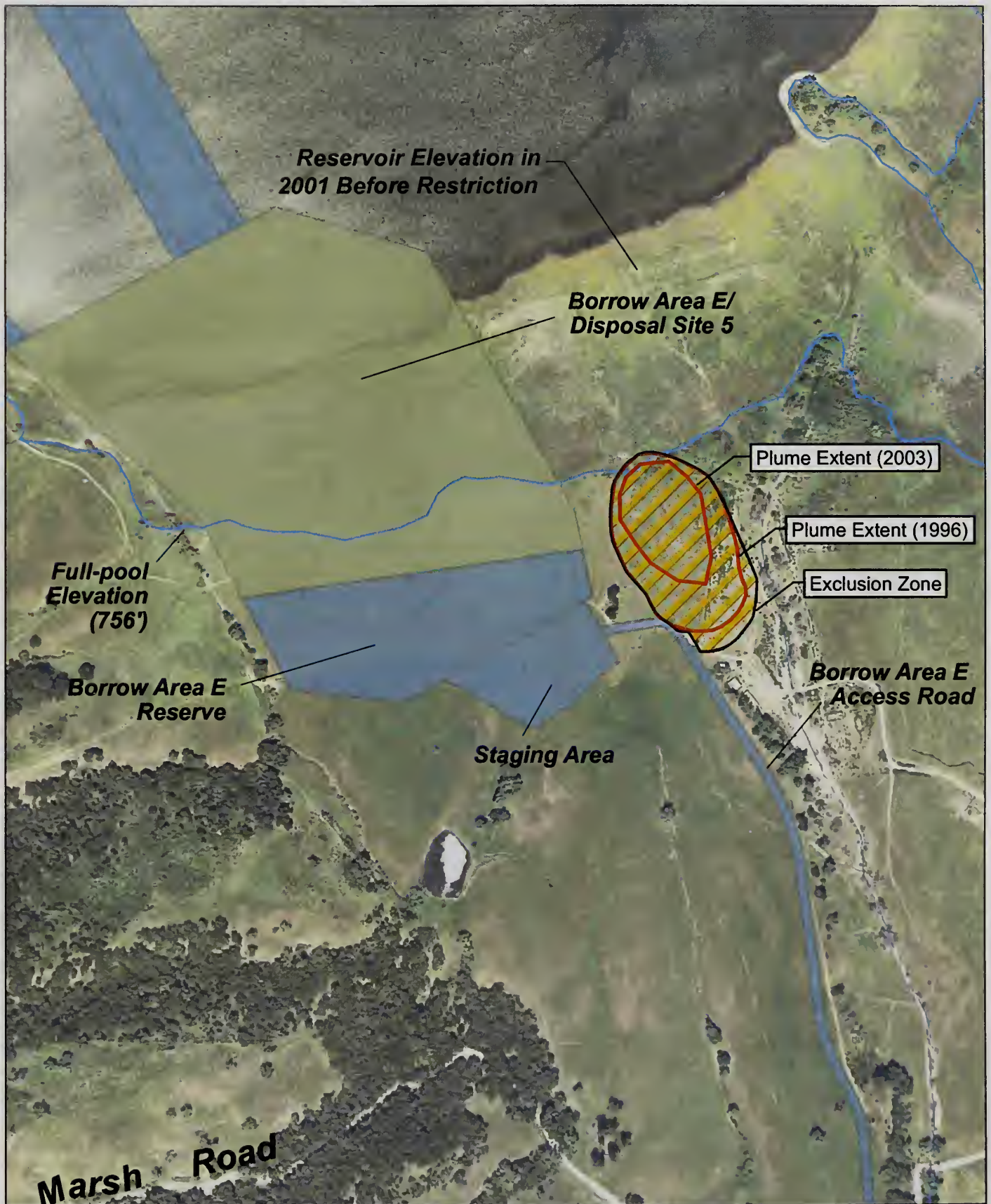
As part of project design, the SFPUC has created a borrow avoidance area shown on Figure 4.9.1 at the south end of the reservoir; the avoidance area encompasses the area affected by the former Calaveras Test Site, including the extent of the groundwater plume in 1996 and the known extent of trichloroethene and lead soil contamination.

4.9.1.5 WILDFIRE HAZARDS

The project area's Mediterranean climate is characterized by long, dry, hot summers and cool rainy winters. Most measurable rainfall occurs from mid-October to mid-April and in most years results in abundant grass growth. May to October is the main fire season, and July is the time of highest fire danger. In that period, as the air temperatures warm, the grasses dry and provide a fuel source for fires. The dry season is approximately 150 days per year; during this season, 15 days, on average, are considered to be extreme fire weather conditions (San Francisco Planning Department 2001).

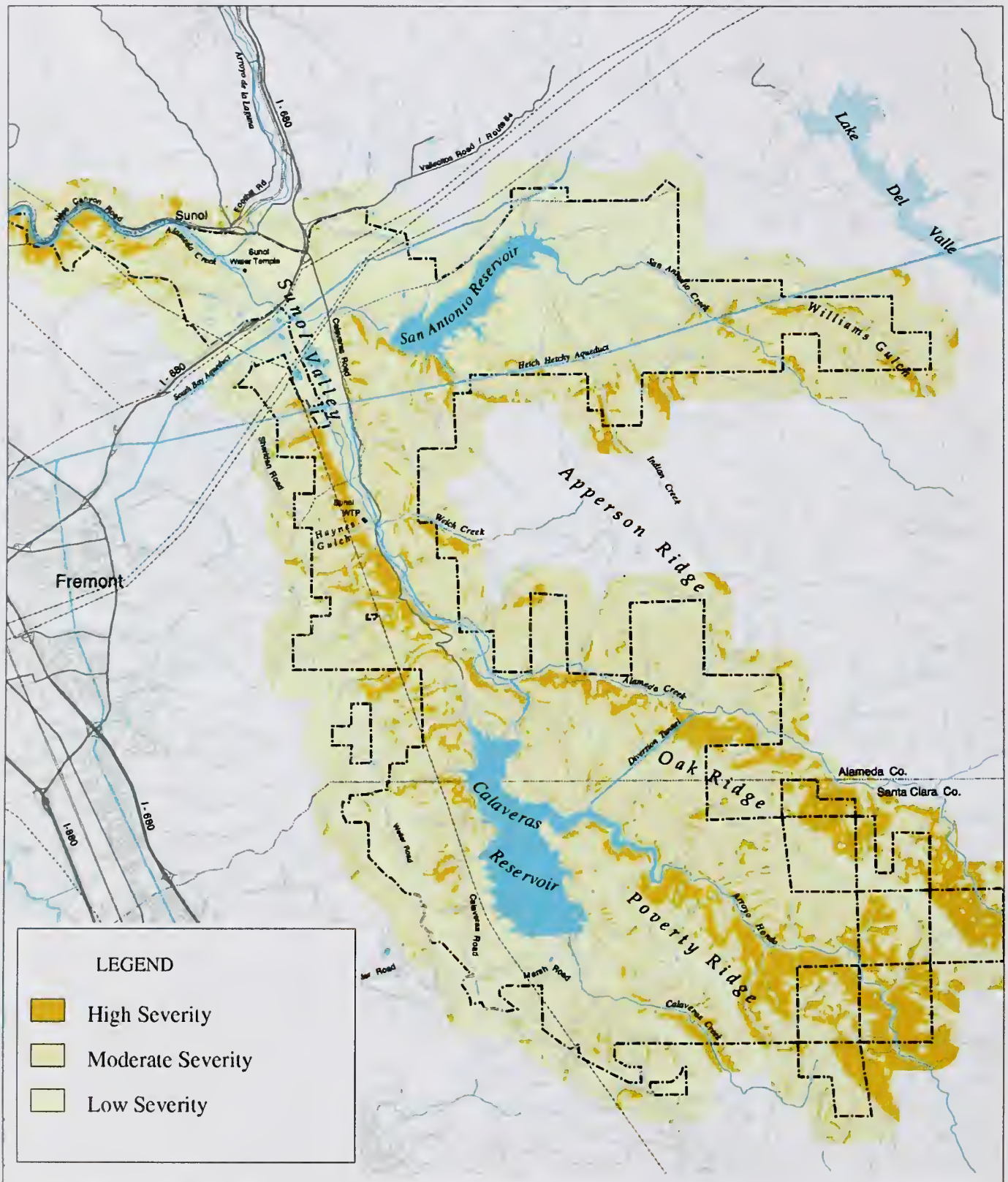
The project area's typical woody and shrub vegetation is drought resistant and adapted to frequent fires. Open grassland, a dominant feature of the landscape that covers over 20,000 acres (over 50 percent) of the SFPUC Alameda Watershed, particularly promotes the likelihood of fires since dry grass is easily ignited. Grassland fires can spread to oak woodland and riparian woodland communities because these vegetation communities are often intermixed or immediately adjacent throughout the watershed, including portions of the project area (San Francisco Planning Department 2001, pp. III.G-2-III.G-3).

Portions of the Alameda Creek watershed that drain to the Calaveras Reservoir are identified by the California Department of Forestry and Fire Prevention (CDF) as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards" (CDF 2000). The *Alameda Watershed Management Plan* (SFPUC 2001) further characterizes areas of the watershed as "low," "moderate," or "high" fire severity areas (see Figure 4.9.2: Wildfire Severity). In addition, expanding areas of residential development adjacent to the watershed and the two East Bay Regional Park District (EBRPD) Regional Preserves (the Sunol Wilderness and the Ohlone Wilderness) are located within high fire hazard areas and provide potential sources of ignition.



SOURCE: Components URS, April 2007; Exclusion zone and plume URS / ERRG, Oct. 2004; Aerials coverage HJW 2001.

**FIGURE 4.9.1: CALAVERAS TEST SITE
BORROW AVOIDANCE AREA**



SOURCE: Wildland Resource Management, ESA ;
GIS Mapping by EDAW, Inc.



CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.9.2: WILDFIRE SEVERITY

4.9.1.6 REGULATORY FRAMEWORK

Subsection 4.9.1.6 Contents

Oversight of Hazardous Materials Release Sites
Above-Ground Storage of Petroleum Products During Construction
Transport, Use, and Storage of Blasting Materials
Transportation of Hazardous Materials
Worker Safety
Regulations for Asbestos-Related Work Activities
 Abatement of Asbestos in Buildings and Structures
 Control of Naturally Occurring Asbestos During Construction
On-Site Disposal of Naturally Occurring Asbestos-Containing Wastes
Lead in Construction Standard
Tunnel Classification and Safety
Wildfires
Spills from Construction Equipment

Oversight of Hazardous Materials Release Sites

The oversight of a hazardous materials release site often involves several different agencies that may have overlapping authority and jurisdiction. Most often the California Department of Toxic Substances Control (DTSC) and RWQCB are the two primary state agencies responsible for oversight. To simplify the oversight process, the California Legislature enacted Assembly Bill 2061 in 1993 to create a process for designating a single administering agency that takes preemptive authority over investigation and cleanup of a site (CHSC, Sections 25260-25268). Under this legislation, a single agency (referred to as the Administering Agency) is designated to supervise all aspects of the investigation and remedial action. That agency is granted jurisdiction over all activities necessary to respond to hazardous materials releases, investigation and remedial action. The Administering Agency must consult with other agencies (Appropriate Agencies or Support Agencies) when issuing permits or authorizations not normally within its jurisdiction. The RWQCB is designated as the Administering Agency for the former Calaveras Test Site, described earlier in Subsection 4.9.1.4.

Above-Ground Storage of Petroleum Products During Construction

The State Water Resources Control Board (SWRCB) requires registration of an above-ground fuel storage tank at a construction site only if the tank is 20,000 gallons or larger, or if the aggregate volume of above-ground petroleum storage is over 100,000 gallons. For smaller temporary tanks used during construction, such as those that would be used for the proposed project, methods for controlling a release and measures to clean up an accidental release and prevent degradation of water quality would be addressed in the best management practices (BMPs) included in the construction Stormwater Pollution Prevention Plan (SWPPP) prepared for the project, as described in Section 4.7, Water Quality.

Transport, Use, and Storage of Blasting Materials

The transport, use, and storage of explosive materials is regulated under the Construction Safety Orders contained in 8 CCR Section 1550 et seq. In accordance with these regulations, any contractor providing blasting services must be licensed by the Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA), and explosive materials must be stored in a proper type of magazine¹⁵ except when they are being used, transported, or are in the custody of a carrier. All magazines must be theft- and weather-resistant and some must also be fire- and bullet-resistant. The specific type of magazine that must be used depends on the quantities and types of explosive materials that are stored and is specified in 8 CCR Section 1562. The transfer of explosive materials must also be arranged so that no undue delay will occur between the time the explosive materials leave the magazine and the time they are used. Also, the contractor would be required to obtain a permit from Alameda County for the use of explosives, to store the explosives in appropriate magazines, and to transport and transfer the explosives in accordance with applicable regulations.

Transportation of Hazardous Materials

The U.S. Department of Transportation regulates the transport of hazardous materials between states. Within California, the state agencies with primary responsibility for enforcing federal and state regulations regarding the transport of hazardous materials are the California Highway Patrol, the DTSC, and the California Department of Transportation. Together, federal and state agencies determine driver training requirements, load labeling procedures, and container specifications. Although certain requirements apply to the transport of hazardous materials, requirements for transporting hazardous waste are more stringent, and hazardous waste haulers must be licensed to transport hazardous waste on public roads.

Worker Safety

Both federal and state laws specify occupational safety standards to minimize worker safety risks from both physical and chemical hazards in the workplace. The federal Occupational Health and Safety Administration is the federal agency with primary responsibility for ensuring worker safety in the workplace. In California, Cal/OSHA has primary responsibility for developing and enforcing standards for safe workplaces. In accordance with Cal/OSHA regulations, a Site Health and Safety Plan must be prepared prior to beginning any work involving disturbance of building materials that contain hazardous substances, to protect workers and the public from exposure to potential hazards.

¹⁵ A magazine is a structure specifically designed for the safe storage of explosive materials.

Regulations for Asbestos-Related Work Activities

State regulations on asbestos are related to abatement of asbestos during building demolition or renovation and disposal of asbestos-containing materials as well as disturbance of rocks containing NOA during construction. These regulations are discussed below.

Abatement of Asbestos in Buildings and Structures

Section 19827.5 of the CHSC, adopted January 1, 1991, requires that local agencies not issue demolition or alteration permits until an applicant has demonstrated compliance with notification requirements under applicable federal regulations regarding hazardous air pollutants in the Bay Area, including asbestos. The Bay Area Air Quality Management District (BAAQMD) is vested by the California legislature with authority to regulate airborne pollutants, including asbestos, through both inspection and law enforcement, and is to be notified 10 days in advance of any proposed demolition or abatement work.

Notification includes the names and addresses of operations and persons responsible; description and location of the structure to be demolished/altered, including size, age, and prior use; approximate amount of friable asbestos; scheduled starting and completion dates of demolition or abatement; nature of planned work and methods to be employed; procedures to be employed to meet BAAQMD requirements; and the name and location of the waste disposal site to be used. The District randomly inspects asbestos removal operations. In addition, the District will inspect any removal operation that is the subject of a complaint.

Contractors who conduct asbestos-related work activities (including abatement) in buildings and structures must follow state regulations contained in 8 CCR Section 1529 and 8 CCR Sections 341.6 through 341.14 where the work would involve 100 square feet or more of asbestos-containing material. Specifically, under 8 CCR Section 341.6, Cal/OSHA must be notified of asbestos-related work activities to be carried out. Contractors must be licensed as an Asbestos Qualified Contractor by the Contractors Licensing Board of the State of California, and registered as such with Cal/OSHA. In addition, a one-time report of the use of carcinogens must be made to Cal/OSHA under 8 CCR Chapter 4, Section 5203. The owner of the property where abatement is to occur must have a Hazardous Waste Generator Number assigned by and registered with the DTSC. The contractor and hauler of the material are required to file a Hazardous Waste Manifest which details the hauling of the material from the site and its disposal. Title 8 CCR Section 1529(b) defines asbestos-containing material as any material that contains more than one percent asbestos.

Control of Naturally Occurring Asbestos During Construction

In 2001, the CARB adopted the Asbestos Airborne Toxic Control Measure (ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations in areas of serpentine and other ultramafic rocks (17 CCR Section 93105), which became effective in July 2002. The ATCM protects public health and the environment by requiring the use of best available dust mitigation measures to prevent off-site migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock, serpentine, or asbestos. The BAAQMD implements the regulation.

For construction activities that would disturb more than 1 acre of land, construction contractors are required to prepare an asbestos Dust Mitigation Plan specifying measures that will be taken to ensure that no visible dust crosses the property boundary during construction. (Because the property boundary encompasses the entire SFPUC Alameda Watershed, this requirement would be implemented to ensure that no visible dust crosses the air monitoring perimeter of the work limits for the CDRP.) The asbestos Dust Mitigation Plan must be submitted to and approved by the BAAQMD prior to the beginning of construction, and the site operator must ensure the implementation of all specified dust mitigation measures throughout the construction project. In addition, the BAAQMD may require air monitoring for off-site migration of asbestos dust during construction activities and may change the plan on the basis of the air monitoring results. Title 17 CCR Section 93105(h)(9) defines asbestos containing material as any material that has an asbestos content of 0.25 percent or greater. A construction contractor engaged in construction activities within materials containing NOA would also be required to comply with the work practices and personnel exposure monitoring requirements specified in 8 CCR Section 1529.

The California Geologic Survey (CGS) has published guidelines for the investigation of NOA (CGS 2002). Under these guidelines, investigations for NOA should include:

- Review of geologic, soils, and vegetation references to estimate the extent of soil or rock containing NOA;
- Site specific mapping of the occurrence of soil and rock containing NOA;
- Use of an appropriate sampling strategy to obtain the most representative information for the proposed project; and
- Appropriate analytical methods for NOA.

The geologic investigation and reporting must be conducted by or under the direct supervision of a professional geologist. The *Naturally Occurring Asbestos (NOA) and Metals Evaluation Report* prepared for the project (URS 2009a) fulfills the requirements of the CGS-required investigation.

On-Site Disposal of Naturally Occurring Asbestos-Containing Wastes

Title 22 CCR Division 4.5, Chapter 11, defines hazardous waste. Title 22 CCR is managed by the DTSC. In accordance with 22 CCR, Sections 66261.24 and 66268.29, an asbestos-containing waste would be considered hazardous if it contains greater than 1 percent asbestos by weight. For asbestos, the specified concentration limits in 22 CCR, Division 4.5, Chapter 11, apply only if the substances are in a friable, powdered or finely divided state. Regulated forms of asbestos include chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos.

Because the proposed project does not involve the transport of surplus rock or soil outside of the project limits or SFPUC property, or on public roadways, DTSC has determined that the “naturally occurring asbestos in earthen materials such as soil or waste rock that are removed, unearthed, or otherwise displaced as a result of excavating or recovering an ore or a mineral is exempt as a hazardous waste” provided that they do not exhibit a hazardous waste characteristic by any other criterion (DTSC 2007).

Lead in Construction Standard

Cal/OSHA’s Lead in Construction Standard (8 CCR Section 1532.1) requires development and implementation of a lead compliance plan when lead-based paint would be disturbed during construction. The plan must describe activities that could emit lead, methods that will be used to comply with the standard, safe work practices, and a plan to protect workers from exposure to lead during construction activities. Cal/OSHA would require 24-hour notification if more than 100 square feet of lead-based paint would be disturbed.

Tunnel Classification and Safety

The California Tunnel Safety Orders (TSO), set forth in 8 CCR Subchapter 20, Article 8, require the California Department of Industrial Relations, Division of Industrial Safety (DIS) to classify all tunnels or portions of tunnels into one of the following classifications:

- Nongassy, the classification assigned when there is little likelihood of encountering gas during the construction of the tunnel.
- Potentially gassy, the classification assigned when there is a possibility that flammable gas or hydrocarbons will be encountered during construction of the tunnel.
- Gassy, the classification assigned when it is likely gas will be encountered, or if monitoring indicates the presence of hazardous gases at a concentration greater than 5 percent of the lower explosive limit.
- Extra hazardous, the classification assigned to tunnels when the Division finds that there is a serious danger to the safety of employees, flammable gas or petroleum vapors emanating from the strata have been ignited in the tunnel, or monitoring indicates the presence of hazardous gases at a concentration greater than 20 percent of the lower explosive limit.

In accordance with the TSO, a tunnel is defined as an underground passageway, 30 inches in diameter or greater, that is excavated by workers below the ground surface. Therefore, the intake/outlet shaft and adits that would be constructed through bedrock of the Temblor Sandstone and Franciscan Complex are subject to the TSO. Based on the odor of hydrogen sulfide gas detected while drilling in some areas of Temblor Sandstone, and the presence of disseminated coal layers in the Temblor Sandstone that could produce methane gas, there is the potential to encounter gassy conditions during tunneling (URS 2007a). The SFPUC will apply for a tunnel classification from the Cal/OSHA Mining and Tunneling Unit, and a classification of the tunnels will be assigned by Cal/OSHA on the basis of geologic assessments and information provided by the SFPUC in accordance with the TSO.

The TSO specify ventilation requirements for all tunnels and require an emergency plan for all tunnel operations that includes maps, ventilation controls, firefighting equipment, rescue procedures, evacuation plans, and communications. For potentially gassy tunnels, the orders specify monitoring requirements during construction. If threshold levels of gases are exceeded, work must halt and may not resume until the DIS has authorized reentry in writing. For gassy tunnels, the TSO specify monitoring requirements for explosive gases; actions to be taken in the event that explosive vapors are identified; additional requirements for ventilation; restrictions on the use of equipment with internal combustion engines and spark-producing work activities such as welding or cutting; restrictions on smoking and possession of personal sources of ignition such as lighters or matches; requirements for a “kill” button to cut off electrical equipment in the event that sufficient vapors accumulate; and provision of a refuge chamber or escape route for employee safety. It is the responsibility of the owner and contractor to comply with the requirements of the TSO, but a Cal/OHSA representative would conduct a pre-job safety walk prior to the start of construction and would conduct periodic inspection of the tunneling operations to confirm compliance.

Wildfires

The California Public Resources Code (PRC), beginning with Section 4427, includes fire safety regulations that restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors¹⁶ on any piece of construction equipment that uses an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire suppression equipment that must be provided on site for various types of work in fire-prone areas. The PRC requirements would apply to construction activities at Calaveras Dam because the dam is located in an area designated by the CDF as a “Wildland Area That May Contain Substantial Forest Fire Risks and Hazards” (CDF 2000).

¹⁶ A spark arrestor is a device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

The project would also be undertaken in accordance with SFPUC's *Alameda Watershed Management Plan* Action fir1 (Fire Pre-Suppression):

- **Action fir1** requires that SFPUC vehicle/equipment comply with the fire prevention regulations established by the CDF for use in the watershed prior to authorizing the use of any vehicle or equipment on the watershed. Non-SFPUC equipment must be certified by the CDF. All vehicles/equipment shall include spark arrestors and carry fire suppression equipment during fire season.

Spills from Construction Equipment

The project would be undertaken in accordance with the following *Alameda Watershed Management Plan* Management Actions pertaining to potential spills from construction equipment:

- Action haz4: Conduct regular servicing for the SFPUC vehicle fleet and equipment so that leaks/drips/spills of contaminants are minimized. Guidelines include the following:
 - Immediately report accidental spills of hazardous materials into surface waters to the Water Quality Bureau and the appropriate state agencies.
 - Require that buckets and absorbent materials be carried in all SFPUC vehicles in case of an accident or breakdown in which vehicle-related fluids are released.
 - Follow appropriate BMPs in Appendix C-6 to minimize leaching of vehicle-related contaminants into the soil or groundwater from facilities.
 - For fire protection purposes, ensure that all vehicles and equipment are equipped with spark arrestors and that each vehicle carries fire suppression equipment.
- Action haz6: Identify high-risk spill potential areas and implement measures (e.g., fines, barricades, etc.) to reduce the risk of hazardous spills.
- Action haz7: Develop spill response and containment measures for SFPUC vehicles on the watershed. These measures should be coordinated with the overall Emergency Response Plan developed in Action saf7.

4.9.2 IMPACTS

4.9.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to hazards and hazardous materials, but generally considers that implementation of the project would have a significant impact if it were to:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through the reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;

- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site which is included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment;
- Be located within an area covered by an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, and would result in a safety hazard for people residing or working in the project area;
- Be located within the vicinity of a private airstrip, and would result in a safety hazard for people residing or working in the project area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury or death involving fires.

Of these, the four criteria that pertain to routine transport, use, or disposal of hazardous materials; emission or use of hazardous materials within one-quarter mile of a school; and proximity to airports (two criteria) were not found to be applicable to the project or were addressed by existing regulations as described below in Subsection 4.9.2.2, Approach to Analysis.

4.9.2.2 APPROACH TO ANALYSIS

The potential for impacts related to hazards and hazardous materials was evaluated according to the significance criteria listed above. The four significance criteria that pertain to routine transport, use, or disposal of hazardous materials; emission or use of hazardous materials within one-quarter mile of a school; and proximity to airports (two criteria) were not found to be applicable to the project or were addressed by existing regulations as described below:

- Although construction-related hazardous materials and explosives would be used temporarily during construction of the replacement dam as discussed below, implementation of the proposed project would not result in a change in the quantity or types of hazardous materials used in operation of the dam, and the dam is not located within one-quarter mile of an existing or proposed school. Therefore, impacts related to the routine transport, use, or disposal of hazardous materials; and use or emission of hazardous materials within one-quarter mile of a school are not applicable to the proposed project.
- Calaveras Dam is not located within an airport land use plan or within 2 miles of a public airport or private airstrip. Therefore, the project would not interfere with flight operation or be at risk of damage from flight operations in the event of an accident, and therefore would not pose a safety hazard for people residing or working in the project areas. The closest airports (Livermore Municipal Airport, Reid-Hillview, and San Jose International Airport) are all located 10 or more miles from the Calaveras Dam. Overflights of large commercial aircraft on southerly approach to Oakland International Airport occur regularly at high elevations (several thousand feet) above the hill crests adjacent to the

reservoir. The likelihood of an accident posing a hazard to the dam (such as a collision of a large airplane with the dam) is remote.

For construction activities the SFPUC would request temporary closure of Calaveras Road between Geary Road and Felter Road, however, emergency providers would continue to have access to the closed portion of Calaveras Road, as described in Section 4.12, Transportation and Circulation. Therefore, impacts related to the potential to impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan would be less than significant.

This assessment focuses on the following issues that apply to the remaining significance criteria listed above:

- The potential for encountering hazardous materials in soil and groundwater during replacement of Calaveras Dam and related construction activities;
- The potential for encountering NOA and naturally occurring metals during construction;
- The potential to encounter gassy conditions while tunneling;
- Potential wildfire hazards associated with project construction;
- Hazardous building materials that could be encountered during demolition required for construction of the dam;
- The potential for a release of hazardous materials during construction;
- The use of explosives during construction; and
- The potential to affect movement of the groundwater plume at the former Calaveras Test Site.

In most cases, the impacts identified below would be less than significant with compliance with existing laws and regulations. Mitigation measures are identified for significant impacts.

The areas of the project site that contain NOA and elevated levels of naturally occurring metals have been delineated by the NOA and Metals Evaluation Report (URS 2009a) which was conducted in accordance with the CGS's Special Publication 124, Guidelines for Investigations of Naturally Occurring Asbestos in California (CGS 2002). The evaluation of the potential to encounter NOA and metals during construction is based on the information provided in this report.

4.9.2.3 PROJECT IMPACTS

Table 4.9.2 summarizes the project-related impacts related to hazards and hazardous materials and their significance determinations. These impacts are further described in this section.

Table 4.9.2: Summary of Hazards and Hazardous Materials Impacts

	Impact	Level of Significance
4.9.1:	Release of hazardous materials in soil and groundwater during construction.	LSM
4.9.2:	Release of airborne NOA and naturally occurring metals from excavation, hauling, blasting, tunneling, placement, and on-site disposal of Franciscan Complex serpentinite or mélange.	LSM
4.9.3:	Potential for an explosion due to gassy conditions during excavation and tunneling.	LS
4.9.4:	Increased risk of fires during construction in an area of high fire danger.	LS
4.9.5:	Release of hazardous building materials from demolition of existing structures.	LSM
4.9.6:	Release of fuel and other hazardous materials to the environment, including Calaveras Reservoir, during construction.	LSM
4.9.7:	Fire and safety hazards from use of explosives during construction.	LS
4.9.8:	Effect of raising the reservoir level following construction on groundwater plume migration or natural attenuation of trichloroethene in the groundwater at the Calaveras Test Site or water quality in Calaveras Reservoir.	LS
<i>Notes:</i>		
LS – Less than significant		
LSM – Less than significant with mitigation		

Construction Impacts

Impact 4.9.1: Release of hazardous materials in soil and groundwater during construction.

If hazardous materials are present in excavated soil and/or groundwater, a release to the environment could occur unless proper precautions are taken, and construction workers could be exposed to the hazardous materials in the soil and groundwater and to chemical vapors during construction. Contaminated soil and/or groundwater could also require disposal as a restricted or hazardous waste.

Hazardous materials could be present in the soil or groundwater at a site if a release of hazardous materials has occurred. Regulatory agencies including DTSC and RWQCB maintain lists of sites with reported releases of hazardous materials pursuant to Government Code Section 65962.5. If construction occurs at or near one of these sites, it is necessary to review site-specific information for the release site to evaluate whether hazardous materials could be encountered in the soil or groundwater during implementation of the project. In addition, hazardous materials could be present in the soil or groundwater as a result of a previously unidentified release. The potential

for a previously unidentified release would be highest in an area historically used for industrial purposes that would have involved the use of hazardous materials.

The potential to encounter unknown hazardous materials in the soil and groundwater during construction of the new dam and demolition of the potassium permanganate building and maintenance warehouse/compressor building is low because Calaveras Reservoir is located on SFPUC watershed land in a rural area, surrounded primarily by agricultural and recreational (Sunol Wilderness) land uses. Because site access is controlled, the potential of direct exposures of the public to hazardous materials would be limited.

Borrow Area E is located at the south end of the reservoir near the former Calaveras Test Site, a known area of low level trichloroethene contamination (listed in the RWQCB SLIC database pursuant to Government Code Section 65962.5 and described in the Setting). CDRP does not involve work at the former Calaveras Test Site, as shown on Figure 4.9.1 and therefore soil contaminated with trichloroethene and other unknown potentially hazardous materials from the Calaveras Test Site would not be used for dam construction.

Borrow Area E is located outside of the known extent of the trichloroethene plume at the former Calaveras Test Site. As specified in Section 3.5.1.4, Sources of Material for Construction, excavation at Borrow Area E would be limited to a depth of 10 to 20 feet below ground surface. The water table has historically been encountered at depths of 20 to 28 feet (URS 2007b) and therefore, proposed excavation at Borrow Area E is not expected to encounter groundwater. In addition, the construction contract requirements would specify that gravel layers exposed along the eastern edge of the borrow area, closest to the former Calaveras Test Site, be covered with a clay blanket to reduce the potential for groundwater movement toward the regraded borrow area after the reservoir level has been restored. Therefore, groundwater dewatering would not likely be required during excavation of Borrow Area E, and excavation would not likely encounter groundwater or affect movement of the known plume at the former Calaveras Test Site.

Regardless, groundwater levels fluctuate over time and if conditions are different than expected, excavation within Borrow Area E could encounter groundwater and could potentially affect movement of the identified groundwater plume at the former Calaveras Test Site. In addition, previously unidentified soil contamination could be identified.

As discussed in the Setting, NOA is likely to be present in Franciscan serpentinite and mélange found at the project site as well as materials derived from these rock types. Potential impacts related to a release of NOA are discussed in Impact 4.9.2, below.

Although the SFPUC has established a Borrow Avoidance Area for the area of the former Calaveras Test Site as described above, impacts related to the potential to encounter hazardous materials in the soil and groundwater would be significant, because previously unidentified soil or

groundwater contamination could be encountered during construction or dewatering, if needed, and could affect movement of the groundwater plume at the former Calaveras Test Site.

Impact Conclusion

This impact would be reduced to a less-than-significant level with implementation of Mitigation Measure 5.9.1, which requires the SFPUC to 1) notify the RWQCB of the planned excavation activities and implement any monitoring requirements specified by the RWQCB to demonstrate that excavation activities in Borrow Area E do not adversely affect the groundwater plume at the former Calaveras Test Site and to detect the presence of previously unidentified contamination, if encountered; and 2) prepare a contingency plan identifying measures that would be taken if monitoring identifies potential effects on the groundwater plume or unanticipated contamination is identified during construction.

Impact 4.9.2: Release of airborne NOA and naturally occurring metals from excavation, hauling, blasting, tunneling, placement, and on-site disposal of Franciscan Complex serpentinite or mélange.

As discussed in the Setting, Franciscan Complex serpentinite and mélange rocks as well as colluvium, alluvium, top soil, and fill derived from these rock types commonly contain NOA (potentially including both chrysotile and amphibole asbestos, fibrous minerals that can be a human health hazard if they become airborne) as well as naturally occurring metals, including arsenic, cobalt, copper, chromium (including hexavalent chromium), and nickel. Persons inhaling low levels of asbestos may be at elevated risk of lung cancer (above background rates) and mesothelioma (a rare form of cancer almost exclusively associated with exposure to fibrous dusts). The risk is a function of the cumulative inhaled dose (number of fibers), and also increases with time since first exposure. Although there are a number of factors that influence the disease-causing potency of any given asbestos deposit, such as fiber length, width, and type (i.e., mineralogy), all forms of asbestos are carcinogens (cancer-causing substances). People inhaling low levels of naturally occurring metals can experience adverse respiratory effects and other long-term health effects through inhalation of metals-containing dust and skin contact with the dust.

As described in the Setting, the mean concentration of asbestos in these rock units ranges from 1.2 percent in the colluvium to 13.5 percent in the blueschist of the Franciscan mélange, and these rock units all contain naturally occurring metals, including arsenic, cobalt, copper, chromium, and nickel. Construction and tunneling within these rock types could release NOA and naturally occurring metals into the air, potentially exposing on-site workers and recreational users in the project vicinity, including bicyclists on Calaveras Road. Although the watershed keeper's residence would be vacated during construction, NOA and metals-laden dust generated during construction activities could settle in the vacated residence and in other on-site structures

including the bluestone building and the hypolimnetic oxygenation facility. On-site disposal of surplus materials derived from the Franciscan Complex serpentinite and mélange rocks could also degrade water quality, unless appropriate control measures are implemented. These potential impacts are discussed below.

Impacts to On-Site Workers and Recreational Users During Excavation, Tunneling, Blasting, Hauling, and Placement

Project-related activities that could produce dust containing NOA and naturally occurring metals include excavation and handling of approximately 4 million cubic yards of Franciscan Complex serpentinite and mélange rock as well as colluvium, alluvium, topsoil, and fill derived from these rock types for construction (of the dam, spillway, Borrow Area B, Disposal Sites 3 and 7, stilling basin, tunnel and adits, and access roads) as well as the removal of the upper portion of the existing dam where some of the fill materials were obtained from serpentinite and mélange as described in the Setting. Use of haul roads constructed within these rock types on the hillside to the west of the existing dam where Franciscan Complex serpentinite and mélange bedrock are mapped (see Figure 4.8.1, in Section 4.8, Geology, Soils, and Seismicity) and placement of surplus rock (including tunnel spoils) could also generate NOA and metals-containing dust. In addition, excavation of Borrow Area B and the stilling basin would require blasting of Franciscan Complex serpentinite and mélange bedrock, and construction of the intake/outlet shaft and adits would require tunneling through Franciscan serpentinite and mélange. Dust and tunnel emissions generated during these construction activities would contain NOA and naturally occurring metals that could be inhaled by construction workers and recreational users, including bicyclists on Calaveras Road. Because of the volume of material disturbed and the proximity of recreational users, potential impacts related to exposure of workers and recreational users to NOA and naturally occurring metals in dust during construction are considered significant.

Impact Conclusion

For recreational users, these impacts would be reduced to less than significant with implementation of Mitigation Measure 5.9.2a, which requires the construction contractor to comply with the BAAQMD's Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations. Because the construction activities would disturb more than one acre of land, the contractor would be required to submit the appropriate notification forms and prepare an asbestos Dust Mitigation Plan specifying measures that would be taken to ensure that no visible dust crosses the air monitoring perimeter of work limits during construction.

Mitigation Measure 5.9.2a also requires the SFPUC to prepare and implement a Comprehensive Air Monitoring Plan specifying the air quality monitoring that would be implemented by a third party consultant qualified in ambient air monitoring under the supervision of a Certified Industrial Hygienist who is also a California Certified Asbestos Consultant to ensure compliance with the

Asbestos ATCM. The Comprehensive Air Monitoring Plan would require both perimeter monitoring to be conducted at the air monitoring perimeter of work limits and construction activity monitoring of specific cells of construction activity within the work limits. The Comprehensive Air Monitoring Plan would specify the location and frequency of monitoring, risk-based trigger levels of asbestos and metals (including chromium, nickel, arsenic, copper, and cobalt) that would be protective of off-site receptors (e.g., recreational users of Calaveras Road and/or nearby trails in the Sunol Wilderness area), and corrective actions to be taken should the acceptable level of asbestos or metals be exceeded at any monitoring location. Should trigger levels be exceeded at a perimeter monitoring location, the SFPUC would notify the appropriate authorities and implement corrective actions including possible closure of the affected road or trail, investigate the cause of the exceedance, and implement corrective actions such as implementation of enhanced dust suppression techniques. Should corrective action fail to bring asbestos or metals concentrations to within acceptable limits, the Comprehensive Air Monitoring Plan would require the contractor to modify or temporarily halt construction activities in areas generating excessive dust until dust generation could be maintained within acceptable levels.

Mitigation Measure 5.9.2b requires the construction contractor to comply with 8 CCR Section 1529, Construction Safety Orders for Asbestos, with additional worker protection measures for the proposed project. The additional worker protection measures would be within the oversight of the third party consultant required under Mitigation Measure 5.9.2a. These additional requirements have been developed in consultation with the SFPUC, the San Francisco Department of Public Health, and Cal/OSHA (URS 2009b), and address educational and training requirements for supervisory staff, personal air monitoring and respiratory protection requirements, acceptable work practices, signage, and personnel decontamination. These modifications would be incorporated into the Contract Documents for the construction project and all workers with the potential to be exposed above permissible exposure limits for asbestos would be required to follow these requirements.

Impacts from Accumulated Dust

During construction, NOA and metals-laden dust could settle in the vacated watershed keeper's residence and could be re-entrained into the air by normal household activities, such as dry-dusting, vacuuming (as asbestos fibers can pass through many types of vacuum cleaner bags), or simply walking on carpets. Re-entrainment would expose building occupants to asbestos and metals, potentially resulting in adverse health effects. Because NOA and naturally occurring metals from accumulated dust could be re-entrained into the air when the watershed keeper's residence is reoccupied at the completion of construction, potentially exposing building occupants to unsafe levels of NOA and naturally occurring metals, potential impacts related to accumulated dust would be significant. To address this impact, Mitigation Measure 5.9.2c requires the construction contractor to protect the watershed keeper's residence from NOA and metals-laden dust through the use of barriers or equivalent containment throughout the construction period.

The acceptable residual level of asbestos and naturally occurring metals in the residence will be specified in the Comprehensive Air Monitoring Plan, and the SFPUC will conduct clearance sampling to demonstrate compliance with these standards and clean the residence to the specified standard if standards are not met upon first sampling.

On-Site Disposal

As discussed in Subsection 3.5.1.6, Disposal Sites, in Chapter 3, Project Description, approximately 4 million cubic yards of surplus rock excavated and handled under the proposed project would be derived from the Franciscan Complex. These materials could potentially contain NOA and metals and would be disposed of in on-site disposal areas (Disposal Sites 2, 3, and 7). Without proper precautions, these materials could become airborne after disposal creating a significant hazard to the public. Although NOA and naturally occurring metals-containing materials would be disposed of in on-site disposal areas as described in Chapter 3, Project Description, disposal of these materials would present a significant impact if they were not appropriately managed and subsequently disposed of improperly.

This impact would be reduced to less than significant with implementation of Measure 5.9.2d, which requires segregation of rock containing NOA and naturally occurring metals from other rock types during construction as well as preparation of an excavated materials management plan specifying how excavated rock will be properly classified and managed during construction.

Impact Conclusion

As discussed above, construction activities in areas that contain NOA and metals could create a significant hazard to the public, construction personnel and SFPUC employees. These hazards are addressed by Mitigation Measures 5.9.2a, 5.9.2b, and 5.9.2c, which require enhanced monitoring and protective measures in addition to compliance with all applicable BAAQMD and Cal-OSHA regulatory requirements. With the implementation of these mitigation measures, the potential impacts related to exposure of workers and recreational users to NOA and naturally occurring metals during construction would be less than significant.

Improper management and disposal of rock containing NOA and naturally occurring metals could create a significant hazard to the public. With the implementation of Mitigation Measure 5.9.2d, which requires proper handling and disposal of such materials, this impact would be less than significant.

Impact 4.9.3: Potential for an explosion due to gassy conditions during excavation and tunneling.

Accumulated natural gases in a tunnel could cause an explosion during construction, endangering workers. As discussed in the Setting, hydrogen sulfide odors have been identified while drilling

in some areas of Temblor Sandstone, and disseminated coal layers in the Temblor Sandstone could produce methane gas. Therefore, there is the potential that gassy conditions could be encountered during excavation and tunneling.

The SFPUC will apply for a gas classification from Cal/OSHA's Mining and Tunneling Unit; this classification would be assigned by Cal/OSHA on the basis of geologic assessments and information provided by the SFPUC in accordance with the TSO. If the tunnels are classified as potentially gassy or gassy, project construction would be performed in compliance with the TSO, which specify requirements for the monitoring of explosive vapors, ventilation, and the restriction of potential ignition sources in tunnels. The DIS could require additional measures if conditions warrant and could shut down the tunneling operation if unsafe conditions were identified. Resumption of tunneling operations would not be allowed until the DIS inspected the tunnel conditions and cleared the tunnel for reentry.

Impact Conclusion

Compliance with the TSO and any additional requirements of the Department of Industrial Safety would ensure that impacts related to a potential explosion would be less than significant.

Impact 4.9.4: Increased risk of fires during construction in an area of high fire danger.

The use of construction equipment and temporary on-site storage of diesel fuel could pose a wildfire risk with the potential to injure workers, the public, and wildlife. The area around Calaveras Dam is mapped by the CDF as a "Wildland Area That May Contain Substantial Forest Fire Risks and Hazards," and construction would occur in areas identified in the *Alameda Watershed Management Plan* as moderate to high fire sensitivity. The time of the greatest fire danger would be during the clearing phase, when people and machines are working in vegetated areas that can be highly flammable. If piled on site, the cleared dry vegetation could also become a fire fuel. Potential sources of ignition include equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a spark, fire, or flame. Such sources include sparks from blades or other metal parts scraping against rock, overheated brakes on wheeled equipment, heated emissions-control devices or vehicles, friction from worn or unaligned belts and drive chains, and burned-out bearings or bushings. Sparking as a result of scraping against rock is difficult to prevent. The other hazards result primarily from poor maintenance of the equipment. Smoking by construction personnel is also a potential source of ignition during construction.

Regulations governing the use of construction equipment in fire-prone areas are designed to minimize the risk of wildfires during construction activity. In accordance with the PRC, the construction contractor would be required to comply with the following legal requirements during construction:

- Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildfire (PRC Section 4442).
- Appropriate fire suppression equipment would be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428).
- On days when a burning permit is required, flammable materials would be moved to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427).¹⁷
- On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines would not be used within 25 feet of any flammable materials (PRC Section 4431).

In addition, the project would be undertaken in accordance with Action fir1 of the SFPUC's *Alameda Watershed Management Plan*, discussed earlier under "Wildfires" in Subsection 4.9.1.6, Regulatory Framework.

Impact Conclusion

By complying with the statutory requirements of the PRC and with *Alameda Watershed Management Plan* Action fir1, impacts related to the potential for wildfires would be less than significant.

Impact 4.9.5: Release of hazardous building materials from demolition of existing structures.

Under the proposed project, the warehouse/compressor building, potassium permanganate building, and intake tower would be demolished. The potential for hazardous building materials in these structures is addressed in the Setting (Section 4.9.1.3, Existing Hazardous Building Materials). As discussed in the Setting, the potassium permanganate building was constructed in 2001, after the use of asbestos, PCBs, and DEHP were discontinued, and there would be a low potential to encounter hazardous building materials other than fluorescent light tubes containing mercury during demolition. The warehouse/compressor building was constructed in 1992; therefore fluorescent light ballasts could potentially contain DEHP, and fluorescent light tubes would contain mercury. These structures could also include lead-based paint, which continues to be used in industrial applications.

¹⁷ The project would not require a burning permit, but these restrictions would apply when burning permits would be required for projects that do involve burning. In Alameda County, this time period would be from May 1st to a date specified by the CDF when the Department has determined that hazardous fire conditions have abated for that year. The Department may also declare that unusual fire hazard conditions exist in the area at any time during the year, and impose these requirements.

The intake tower was constructed in 1925 and renovated in 1992. Although a hazardous materials building survey has not been completed for this structure, it could potentially contain hazardous building materials including asbestos-containing building materials and lead-based paint, and electrical equipment containing PCBs. In the absence of proper abatement procedures, demolition or renovation of a structure that contains hazardous building materials can expose workers to hazardous materials.

There are well-established regulatory requirements for asbestos abatement in structures, described above in “Abatement of Asbestos in Buildings and Structures” under Subsection 4.9.1.6, Regulatory Framework. These regulations and the procedures, already established as a part of the permit review process, would ensure that any potential impacts due to disturbance of asbestos during demolition would be reduced to a less-than-significant level.

Cal/OSHA’s Lead in Construction Standard (8 CCR Section 1532.1, described in the Setting, addresses safe handling of lead-based paint during demolition. To determine if this standard would apply, the SFPUC would sample the paint to be disturbed to determine the lead content. If lead is detected, the construction contractor would be required to comply with the Lead in Construction Standard. This standard requires that the contractor develop and implement a lead compliance plan describing activities that could emit lead, methods that will be used to comply with the standard, safe work practices, and a plan to protect workers from exposure to lead during construction activities. Cal/OSHA would require 24-hour notification if more than 100 square feet of lead-based paint would be disturbed. Safe work practices employed in accordance with the Lead in Construction Standard would likely prevent the paint from becoming separated during demolition and contaminating surrounding soil. These regulations and the procedures, already established as a part of the permit review process, would ensure that any potential impacts due to disturbance of lead-based paint during demolition would be reduced to a less-than-significant level.

Impacts related to disposal of electrical equipment that could contain PCBs, fluorescent light ballasts that could contain DEHP or PCBs, and fluorescent light tubes that contain mercury would be significant because these materials are considered hazardous wastes, as discussed in the Setting.

Impact Conclusion

Implementation of Mitigation Measure 5.9.5, which requires legal disposal of electrical equipment containing PCBs as well as fluorescent light tubes and ballasts, would reduce this impact to a less-than-significant level.

Impact 4.9.6: Release of fuel and other hazardous materials to the environment, including Calaveras Reservoir, during construction.

Potassium permanganate that is currently used for water treatment would be removed from the site and disposed of in accordance with applicable law and regulations prior to demolition of the potassium permanganate building. Therefore, impacts related to the use of potassium permanganate during construction would be less than significant.

Several types of hazardous materials would be used during the construction of the replacement dam, including gasoline and diesel fuel, other types of chemicals used for vehicle maintenance (oils, battery fluids), and chemicals used or stored in appurtenant buildings (paints, solvents, disinfectants, pesticides, and cleaners). All of these materials would be stored and used on the site and, without proper precautions, an accidental release of hazardous materials could enter Alameda Creek, Calaveras Creek, or Calaveras Reservoir and degrade the water quality. An accidental release of hazardous materials that degraded water quality in Calaveras Reservoir, Calaveras Creek, or Alameda Creek would be a significant impact.

Impact Conclusion

This impact would be reduced to a less-than-significant level with implementation of Mitigation Measure 5.7.1, Storm Water Pollution Prevention Plan, which requires preparation and implementation of an SWPPP, as required by the RWQCB (also see the discussion in Impact 4.7.2 in Section 4.7, Water Quality). The SWPPP would specify handling, storage, and spill response requirements for hazardous materials used during construction that would be protective of water quality and the environment. The project would also be undertaken in accordance with *Alameda Watershed Management Plan* Actions haz4, haz6, and haz7, discussed earlier under “Spills from Construction Equipment” in Subsection 4.9.1.6, Regulatory Framework.

Impact 4.9.7: Fire and safety hazards from use of explosives during construction.

While construction activities could involve the use of explosives, this use would be regulated by Alameda County and subject to the regulatory requirements contained in 8 CCR, implemented by Cal/OSHA. In accordance with these requirements, the contractor would be required to obtain a permit from Alameda County for the use of explosives, to store the explosives in appropriate magazines, and to transport and transfer the explosives in accordance with applicable regulations. The work would be continuously monitored on site by the SFPUC and independent inspectors for strict compliance with contract safety provisions and regulatory requirements. Careful implementation of these safety measures could ensure minimal risk to workers and the public.

Impact Conclusion

By complying with these requirements for explosives handling, impacts related to the use of explosives would be less than significant.

Impact 4.9.8: Effect of raising the reservoir level following construction on groundwater plume migration or natural attenuation of trichloroethene in the groundwater at the Calaveras Test Site or water quality in Calaveras Reservoir.

Restoration of Calaveras Reservoir water levels to the pre-DSOD restricted level of 756 feet would not inundate the former Calaveras Test Site. Although the restored reservoir level would be close to the estimated 2003 downgradient extent of the groundwater plume (Figure 4.9.1), natural attenuation of trichloroethene in the groundwater is continuing, which will contribute to a decrease in trichloroethene concentrations in the groundwater. In addition, the increase in reservoir water levels would likely result in a flatter groundwater gradient than current conditions, therefore slowing groundwater flow and contaminant migration rates and reducing risks to water quality in Calaveras Reservoir. Furthermore, groundwater quality monitoring would continue until regulatory closure of the groundwater contamination case is granted by the RWQCB.

Impact Conclusion

Potential impacts on the groundwater plume and on Calaveras Reservoir water quality would be less than significant.

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PERSONAL COMMUNICATIONS

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4.10 CULTURAL RESOURCES

Section 4.10 Contents	
4.10.1 Setting	4.10.2 Impacts
4.10.1.1 Study Area	4.10.2.1 Significance Criteria
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This section presents an analysis of potential impacts of the proposed Calaveras Dam Replacement Project (CDRP) on cultural resources. Cultural resources are defined as buildings, sites, structures, or objects that may have historical, architectural, archaeological, cultural, paleontological, and/or scientific importance. Laws and regulations on both the federal and state levels seek to protect and target the management of cultural resources. The primary regulatory framework directing the treatment of cultural resources includes the National Historic Preservation Act (NHPA) of 1966 as amended and its implementing regulations at 36 Code of Federal Regulations (CFR) 800; the National Environmental Policy Act (NEPA) of 1969; and the California Environmental Quality Act (CEQA). Collectively, these regulations and guidelines establish a comprehensive program for the identification, evaluation, and treatment of cultural resources. The significance threshold under NHPA and CEQA are resources' eligibility for listing on the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR), respectively. Effects on NRHP- and CRHR-eligible resources (called historic properties and historical resources, respectively) must be considered in the environmental review process.

Section 15064.5 of CEQA also assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. These procedures are detailed under California Public Resources Code (PRC) Section 5097.98. Impacts to "unique archaeological resources" and "unique paleontological resources" are also considered under CEQA, as described under PRC Section 21083.2 and discussed below.

The Setting subsection defines the "Study Area" of the proposed CDRP; provides an overview of the historic context of the project vicinity; describes the regulatory framework related to cultural resources; and identifies and evaluates the significance of cultural resources that may be affected by the proposed project. The Impacts subsection identifies and evaluates the project's potential impacts on cultural resources, and identifies mitigation measures that would reduce or avoid potentially significant impacts.

4.10.1 SETTING

This subsection is based on an Archaeological Survey Report (ASR) (ETJV 2008) and a Historic Resources Inventory Evaluation Report (HRIER) (JRP 2007) (see Appendix E). The ASR was prepared by EDAW & Turnstone Joint Venture (ETJV), based on information developed by Archaeological Resources Technology (ART) and ETJV. The HRIER was prepared by JRP Historical Consulting, LLC (JRP) based on information developed by ART, JRP, and ETJV.

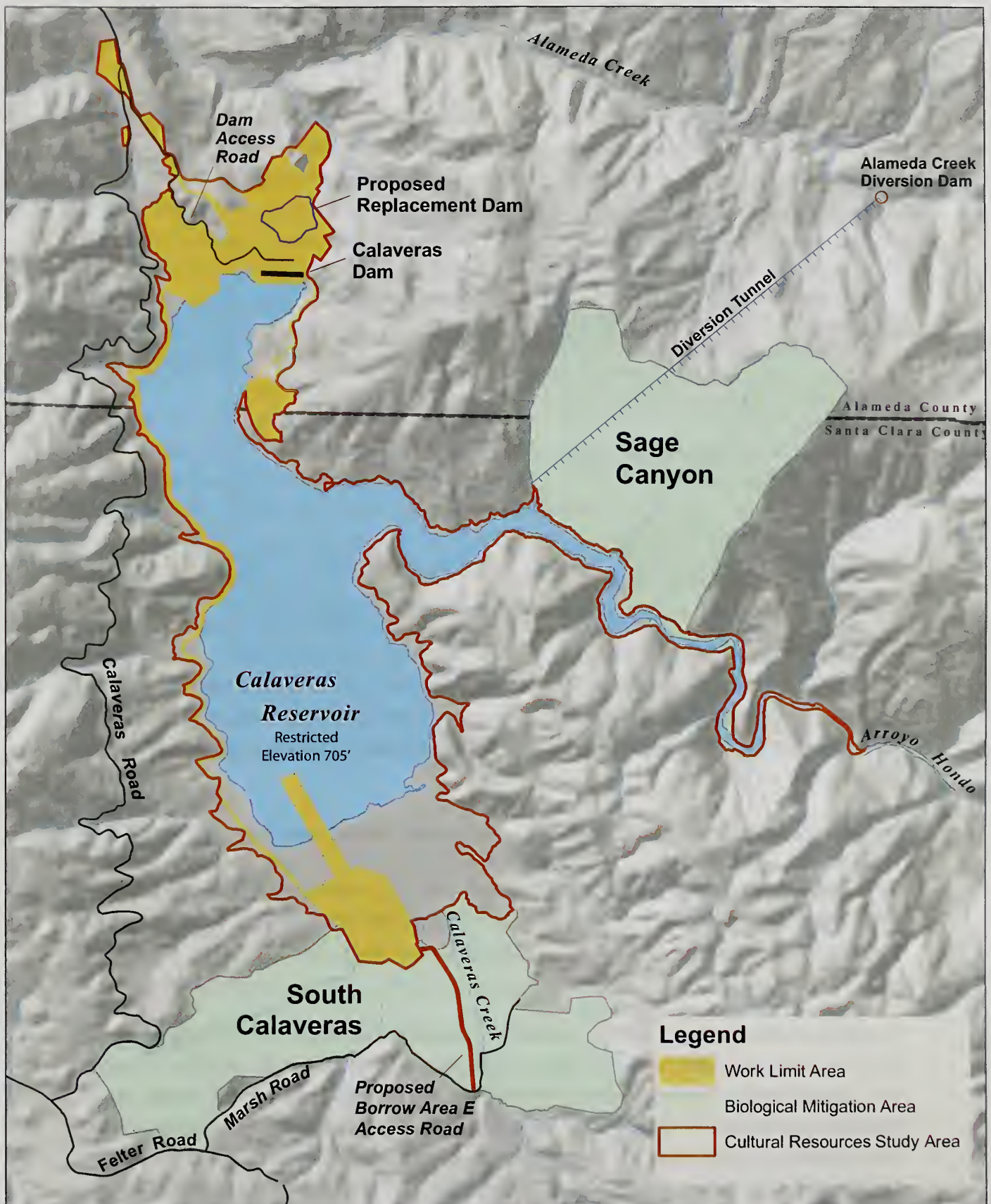
4.10.1.1 STUDY AREA

For the purposes of providing a historic context for resources that may be affected by the proposed project, the term “project vicinity,” as used in this section, encompasses the portion of San Francisco Public Utilities Commission (SFPUC) Alameda Watershed lands comprised of Sunol Valley, Calaveras Valley, Arroyo Hondo, and Alameda Creek.

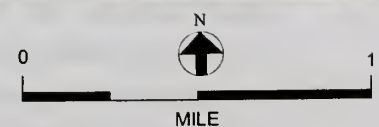
For the purposes of this section, the term “Study Area” refers to a smaller, defined area within the larger project vicinity. The Study Area is the geographic area or areas within which the undertaking may directly or indirectly cause alterations in the character or use of historical resources, if any such properties exist. The Study Area includes the area of Calaveras Valley surrounding the reservoir that may be directly affected by ground disturbance and demolition resulting from the various construction activities. These activities are described in Subsection 3.5, Project Construction, in Chapter 3, Project Description. The SFPUC has established a Work Limit Area for the CDRP (see Figure 4.10.1: Cultural Resources Study Area and Work Limit Area). The construction contractor would be required to work inside this area. The Work Limit Area encompasses all construction activities including construction of new structures, excavation, disposal sites, haul roads, and access and staging areas. The Study Area includes the Work Limit Area as well as the currently exposed areas at the perimeter of the reservoir that would be re-inundated when the pre-Division of Safety of Dams (DSOD)-restricted water level has been restored at the completion of construction.

Also shown on Figure 4.10.1 are two Biological Mitigation Areas (South Calaveras and Sage Canyon) that are adjacent to the Study Area. These areas are among the four Biological Mitigation Areas that have been identified as suitable potential locations within which habitat restoration efforts to mitigate the CDRP’s adverse impacts on biological resources are proposed.

Potential impacts of ground-disturbing biological mitigation activities on cultural resources are discussed separately in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project.



SOURCE: URS



CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.10.1: CULTURAL RESOURCES STUDY AREA AND WORK LIMIT AREA

4.10.1.2 CONTEXT

Subsection 4.10.1.2 Contents

Project Vicinity Geology, Topography, Soils, and Vegetation

Paleontology

Prehistoric Archaeological Research and Setting

Paleo-Indian Period (ca. 12,000-8000 years Before Present)

Lower Archaic Period (ca. 8000-5000 B.P.)

Middle Archaic Period (ca. 5000-2500 B.P.)

Late Archaic Period (ca. 2500-1000 B.P.)

Emergent Period (ca. 1000-200 B.P.)

Ethnographic Setting

Influence of the Spanish Missions

Local Ethnographic Sites

Historic Setting

Spanish Period (1769-1822)

Mexican Period (1822-1848)

American Period (1848-Present)

Acquisition and Water Development in Calaveras Valley (1870s-Present)

Calaveras Test Site (1948-1972)

This subsection provides a context for the project vicinity in order to assess the likelihood of encountering cultural resources, identify the types of resources expected to be present, and provide a framework by which to evaluate the significance of resources that may be affected by the proposed project.

Project Vicinity Geology, Topography, Soils, and Vegetation

The topography, soils, and vegetation in the project vicinity comprise an environment conducive to prehistoric and historic human habitation. Information about these characteristics is presented here to provide a context for discussion of prehistoric and historic occupation of the project vicinity.

Topographically, the project vicinity can also be divided into two areas: the Calaveras Valley, and the surrounding hills, ridges, and steep ravines that make up the Upper Calaveras, Alameda, and Arroyo Hondo Creeks watersheds. Within Calaveras Valley, steep hillsides interspersed with recent alluvial fan deposits extend from the drainages into the reservoir along the east and west sides of the valley. On the southern edge of the project vicinity, Calaveras Creek emerges from the hills, forming a broad, gently sloping alluvial fan extending into the reservoir. Within Arroyo Hondo, highly eroded steep valley walls extend straight into the reservoir. Slopes in this portion of the project vicinity vary considerably from 0 to 30 percent, and elevation ranges from 700 feet above mean sea level (elevation of reservoir at time of study) to 1,000 feet.

There are several different soil types within the project vicinity. Along the east and west edges of the reservoir and within Arroyo Hondo, where the lower slopes approach the valley floor, is a mix of Los Osos clay and silt loam, and Gaviota-Los Gatos complex. These soils are well drained, have moderate erosion potential, and can vary from shallow (from about 6 to 20 inches) to moderately deep (up to about 48 inches). On the alluvial deposits in the southern part of the project vicinity, and along some of the valley margins, are Yolo loam, Zamora loam, and the Pleasanton gravelly loam. These are well-drained, very deep soils (up to about 72 inches) with low erosion potential. Due to these factors, these depositional soils have the potential to preserve archaeological artifacts and features (USDA 2009).

Rockland soil, which consists of a very thin layer of soil (about 0 to 6 inches) covering bedrock, surrounds the dam on the north and west sides. On the west-facing slope above the spillway, the large hill area northwest of the dam and most of the slope between Calaveras and Marsh Roads is made up of the Los Gatos-Los Osos complex, which is a moderately deep, moderately drained clay loam. Perkins loam surrounds much of Calaveras Road and the access road leading to the dam. This soil is typically moderately deep, well drained, and highly susceptible to erosion.

The project vicinity includes three main drainages: Alameda Creek, lower Calaveras Creek, and Arroyo Hondo. Prior to the flooding of Calaveras Valley, alluvial fan deposits extended onto the valley floor with alluvial soils forming on the gentler slopes of fan deposits—similar to those at the southern edge of the reservoir. This setting would have likely supported grassland and riparian woodland community, surrounded by oak woodland extending onto the adjacent hillsides.

Within the project vicinity, one of the most prominent vegetation types is the non-native grassland community, which encompasses the west-facing slopes of Poverty Ridge, the area southeast of the reservoir, and the portions of Calaveras Valley not inundated by the reservoir. This community tends to grow as dense to sparse covers of annual grasses along relatively flat plains and rolling hills. The area also supports upland woodland (oak woodlands, oak savannah, mixed evergreen forest), scrub communities, and riparian forest.

Paleontology

The project vicinity is within a geologic locality where the probability for the presence of paleontological resources is high. Summary information is provided here to provide a context for discussion of potential impacts on paleontological resources in the Study Area. The region is underlain by marine sedimentary rocks, including the Panoche Formation, Monterey Formation, and other fossil-bearing, marine and non-marine sandstone, siltstone, or gravel deposits ranging in age from 10,000 to 5.3 million years old. Fossil localities have been identified in the Sunol Valley and surrounding area (UCMP 2006). The majority of the fossils found in the region are vertebrate fossils of the Pleistocene epoch found in sediments, including extinct bison, camels,

boney fish, mammoths, and horses, although some localities contain marine invertebrate fossils such as bivalves (clams). A fossil of a mastodon from the Pleistocene epoch was discovered in Sunol, while an unidentified vertebrate fossil was discovered in the vicinity of Calaveras Dam (UCMP 2006).

The distribution of fossil localities and the location of corresponding geologic units indicate that most of the paleontological resources in the region are east and south of Interstate 680 (I-680) in the upland foothills of the Diablo Range. Fossil localities diminish west of I-680, towards the Santa Clara Valley, because the Santa Clara Valley and the south San Francisco Bay margin is underlain by much younger alluvial and basin deposits that do not contain abundant fossil remains. There are 280 fossil localities in Alameda County, but only 36 in Santa Clara County (UCMP 2006). Some of the fossil localities in Santa Clara County contain vertebrate fossils, including a bison and another mammal that appears to be an ancient descendant of an elephant or sea cow.

Prehistoric Archaeological Research and Setting

Numerous investigations into central California and San Francisco Bay Area prehistory have occurred over the past century. Early work around the turn of the century by Nels Nelson documented over 100 bayshore sites, and led him to develop the first model of prehistoric Native American cultural development for this area. Building on this work during the 1920s through the 1950s, several researchers contributed to the establishment of the Central California Taxonomic System (CCTS), which defined three horizons: Early, Middle, and Late.

During the 1960s and 1970s, several excavations within the Bay Area and central California began to reveal a cultural complexity and succession that was far greater than previously realized. This brought the CCTS under fire as being overly simplistic and inadequate to convey the complex nature of Bay Area prehistory. In response to this, a new system based on changes in social complexity, technological developments, and subsistence patterns was developed. This system divided the archaeological record into three temporal periods: Paleo-Indian, Archaic (including early, middle, and late components), and Emergent. Additionally, it illuminated several patterns (the *Windmill*, *Berkeley*, and *Augustine Patterns*) that describe similar economic and social traits within a geographical area.

Paleo-Indian Period (ca. 12,000 – 8000 years Before Present)

The earliest documented human occupation in California occurred during the Paleo-Indian Period, which was characterized by changing climates and rising sea levels. It is suspected that people lived in small, highly mobile groups, moving through broad geographic areas and leaving relatively little behind in the way of archaeological remains. The recent radiocarbon dating of a human skeleton from the Channel Islands in southern California to 13,100 Before Present (B.P.)

has led many scholars to reassess the antiquity of human occupation in California and the nature of how those colonizing populations arrived here. Only a few indications of a Paleo-Indian occupation have been recovered from central California, but the period is well represented at Borax Lake in Lake County, about 110 miles to the northwest of the project vicinity. No evidence of Paleo-Indian occupation has been uncovered in the project vicinity.

Lower Archaic Period (ca. 8000-5000 B.P.)

During the Lower Archaic Period (8000-5000 B.P.) many ancient lakes began to dry up and sea levels continued to rise due to climate change. Archaeological assemblages from this period suggest an emphasis on plant resources, resulting in an increase in milling stones found at archaeological sites, rather than on hunting (typically suggested when projectile points are found at archaeological sites). Most stone artifacts from this time were made of local materials, indicating a lack of extensive trade networks. Evidence of a Lower Archaic period occupation has been documented in several areas in central California, including a site that is located approximately 20 miles north of the project vicinity and situated in an upland valley setting similar to that of the project vicinity.

Middle Archaic Period (ca. 5000 – 2500 B.P.)

Both climate change and sea level rise began to stabilize during the Middle Archaic Period. Generally during this time, there was a shift to an acorn-based subsistence economy, indicated by the introduction of mortars and pestles, and an increased use of projectile points, suggesting a renewed reliance on hunting. Near the project vicinity two distinct patterns of material culture began to develop during this time period. The *Windmill Pattern*, characterized in part by distinctive burial practices (ventral extension with a western orientation plus abundant mortuary goods), occurs in the San Francisco Bay Delta region. At the same time, peoples associated with the *Lower Berkeley Pattern*, also defined by burial practices (flexed burials with no orientation and a lack of mortuary goods), inhabited the San Francisco Bay Area. While several examples of *Lower Berkeley Pattern* occupation are present north of the project vicinity near Walnut Creek and Berkeley, no examples have been identified within the southeast portion of San Francisco Bay.

Late Archaic Period (ca. 2500-1000 B.P.)

During this period, an increase in sociopolitical complexity occurred, and shell bead use (indicating changes in individual status) and routine exchange between groups also developed. Within the Bay Area, later manifestations of the *Berkeley Pattern* extend into and dominate the archaeological record from this time period. Archaeological traces characteristic of this pattern include thick shell middens that ring the Bay Area, prominent bone tool use, flexed burials of varying orientation, and a higher proportion of mortar and pestle milling tools to projectile points.

The preponderance of milling tools and the relative scarcity of projectile points on archaeological sites suggest a decrease in the importance of hunting as a primary subsistence activity. Numerous examples of Late Archaic *Berkeley Pattern* sites present near the project vicinity are also present in upland settings near the San Ramon and Livermore Valleys.

During the Late Archaic Period there was a brief emergence of the *Meganos Aspect* of the *Berkeley Pattern* that was prominent in the project vicinity. This aspect is described as an intrusion of people from the Delta area in the east towards the Bay Area, which created a culture containing traits of the *Berkeley Pattern* and holdovers from the interior *Windmill Pattern*. The *Meganos Aspect* is still poorly understood, but several examples of it have been documented near the project vicinity, all within the vicinity of Fremont.

Emergent Period (ca. 1000-200 B.P.)

Archaeological and later ethnographic evidence indicates that broad social, economic, and technological changes swept through central California during this period. Within the Bay Area, the *Augustine Pattern* represents this period, which is a combination of traits of the earlier *Berkeley Pattern* and innovations from new native populations that may have moved into the region. Arrow points, shaped mortars and pestles, bone tools, fishing implements, charmstones, and olivella beads—and a later introduction of clam disk bead money—characterize the archaeological record of the *Augustine Pattern*. Other innovations and trends include the introduction of the bow and arrow, the rise in the role of fishing in the subsistence economy, the acorn as the prominent staple, and the development of elaborate trade networks. Mortuary practices were variable (grave pit burning, flexed and cremated burial), and considerable variation in grave goods indicates greater distinctions in wealth, status, and power among individuals and cultural groups. Settlements during this time increased in number yet decreased in size. They were prominent in the Bay Area, around margins of the Bay and confluences of stream and river channels such as those in and near the Calaveras Valley. Towards the end of this time, regular contact with Euro-American populations occurred, forever changing the life-ways of the native California peoples.

Ethnographic Setting

Between 1901 and 1930, pioneering anthropologists of the University of California at Berkeley laid the groundwork for understanding California's indigenous people. Due to the great diversity that existed within pre-colonial California, these early anthropologists created a framework to organize populations into language groups. The people living in central coastal California at the time of contact were grouped into the *Costanoan* language family (also referred to as *Ohlone*), which occupied the coastal area from San Francisco Bay to south of Monterey Bay. Eight separate language groups are believed to have been within this family. Around 50 politically autonomous groups—referred to as tribelets—ranged in population from 50 to 500.

Linguistically, the *Costanoan* people were divided into large groups consisting of sets of tribelets that spoke a common dialect within a particular geographical area. The tribelets that occupied the land from Richmond to Mission San Jose to the Livermore Valley are believed to have spoken Chochenyo, one of the eight separate language groups within the *Costanoan* family. Mission register records and other ethno-historic data indicate that at the time of contact the project vicinity was at, or near, the border of three distinct tribelets. The historical data are too ambiguous to determine exactly which group(s) held this territory and where the borders between them were located; however, a few generalizations can be drawn. The *Asirin* occupied the upper portions of Alameda Creek and the mountains east of Mission San Jose. The *Santa Ysabel* group was centered on Penitencia Creek near present-day San Jose, but also held the upper parts of Calaveras Creek. The *Taunan* occupied the rugged portions of Alameda Creek that likely included the project vicinity. Ethnographers have conjectured that Alameda Creek was a major access route between the San Francisco Bay and the Diablo Range.

The *Costanoan* practiced a mixed hunter and gatherer economy and were organized into family groups that initiated residential movements from coastal sites toward the interior valleys according to food supply and social factors. Tribelets controlled territories, which were based on geographic features. Within these territories, there were most likely one or more permanent villages surrounded by temporary camps used in exploiting seasonal resources. The most prominent feature of a major settlement was the sweathouse or roundhouse, which was an earth-covered, semi-subterranean domed structure. Dispersed around these ceremonial centers were small, also earth-covered, domestic dwellings built upon bent-pole frameworks.

The *Costanoan* carefully managed the landscape within their territory. They used controlled burns to enhance the wildlife habitat of desirable fauna. This burning also eased the gathering of acorns, a staple food for the *Costanoans*. Other plants utilized ethnographically include nuts of buckeye, laurel and hazelnut trees, seeds of various plants, numerous berries, and roots. Animals consumed by the *Costanoan* included deer, elk, antelope, grizzly bear, sea lion, whale, various small mammals, numerous species of birds and waterfowl, and several species of fish including steelhead, salmon, and sturgeon. The *Costanoan* people traded mussels, abalone shells, salt, and dried abalone with neighbors to the east, and obtained piñon nuts, obsidian, and other items in return.

Influence of the Spanish Missions

With the establishment of seven Spanish missions within traditional *Costanoan* territory beginning in 1770, native peoples experienced dramatic cultural changes. The introduction of Spanish administration led to the relocation of many native Californians from their villages to missions for the purpose of being “converted” to Christianity and assimilation into European cultural/economic systems and to serve as laborers. The exact timing and nature of the relocation

of the triblets associated with the project vicinity is difficult to determine. Mission Santa Clara began assimilating Indians in 1777, but their records prior to 1806 are problematic for determining tribal group affiliation. In 1797, Mission San Jose de Guadalupe (Mission San Jose) began assimilating Indians, yet their registers provide no tribal names until 1803. Despite this information gap, it appears likely that the *Asirin* group was assimilated or otherwise brought under Spanish administration around 1801 to 1806 in both the Santa Clara and San Jose Missions. The relocation of the *Santa Ysabel* group began at the founding of the Santa Clara Mission and spanned over almost two decades, from 1777 to 1808. The *Taunan* group was likely assimilated or relocated at the Santa Clara Mission throughout the 1790s and later in the San Jose Mission up to 1805.

At the missions, native groups were subjected to a regimented daily routine of agricultural labor. By 1810, the indigenous people of western and central Alameda and Santa Clara counties had been entirely relocated to the missions. With notable exceptions, such as the village of Alisal (just south of Pleasanton) where the traditional native social system persisted into the 20th century, the indigenous mode of existence had largely disappeared by 1810. By 1935, for all practical purposes the *Costanoan* language was extinct and, by 1968, less than 200 people could claim probable *Costanoan/Ohlone* descent. Today, however, the *Ohlone* people are reinvesting in their culture and traditional life-ways. Through new-found political, economic, and social influence *Costanoan* peoples constitute a thriving native community within the broader context of present-day California.

Local Ethnographic Sites

There are three documented prehistoric/ethnographic village sites in the vicinity of or within the Study Area. The village site of El Molino is located near the Sunol Water Temple, and Alisal (or “Chumison”) is situated south of Pleasanton. The village of Aloc, the possible southernmost extent of the *Taunan* group, is mentioned in the 1801 and 1806 Mission Santa Clara records that indicate it was “probably [located] in the area east of Mission San Jose, where Calaveras and Alameda creeks meet.” This location, while ambiguous, establishes the location of this village immediately adjacent to the northeastern boundary of the Study Area. Additionally, a quote discussing observations made by early Euro-American settlers of the Calaveras Valley mentions Indians living in this area during the 1850s. If the ethnographic village Aloc did exist in the Calaveras Valley, it is most likely beneath the area that now contains Calaveras Reservoir, specifically in the vicinity of the existing dam. Early project drawings for the dam show that the area of the spillway and base of the dam were “scraped of all soil” and, therefore, any remains of this village would be highly disturbed, if not removed entirely, at the dam location.

Further suggesting this site was located under or near the dam is a letter from M.M. O’Shaughnessy, San Francisco City Engineer, to S.P. Eastman of the Spring Valley Water

Company (SVWC) requesting that Native American remains uncovered during initial dam construction be “secured” for the University of California Museum in San Francisco (O’Shaughnessy 1915).

Historic Setting

Spanish Period (1769-1822)

Spanish explorers had ventured into Monterey Bay and San Francisco Bay areas by the early 17th century. The first inland explorations into present-day Santa Clara County and Alameda County were led by Pedro Fages. Between 1770 and 1772, Fages traveled north from Monterey, through the Santa Clara Valley and along the east shore of San Francisco Bay as far as the Carquinez Strait, heading back to Monterey through the valleys that are now the I-680 corridor. Near Sunol, Fages and his men descended Arroyo de La Laguna, crossed the Alameda Creek, and climbed Mission Pass. In 1776, Juan Batista de Anza took a similar trip commencing at the south end of the Bay and headed north through Oakley, Byron, and Bethany via the eastern Alameda County and Santa Clara County borders. The early Spanish presence in the region was ephemeral at first. It was not until 1797 that a sustained Euro-American presence in the area was established with the construction of the Mission San Jose 2.5 miles west of the project vicinity in present-day Fremont.

Mexican Period (1822-1848)

The passing of political control of California from the Spain to Mexico in 1822 led to a change in the traditional mission system. The missions, originally planned as agrarian self-sufficient communities, were secularized and transformed into local churches; their lands became available for acquisition. The government began to secularize mission lands to encourage settlement and granted large parcels of land to individuals, who were primarily engaged in the cattle and tallow trade. By the mid-1840s, over 8 million acres of mission lands under the authority of the Roman Catholic Church had been transferred to some 800 families.

The Spanish and Mexican governments issued 65 land grants in Alameda and Santa Clara counties. The principal rancho that occupied lands that later became part of the Alameda Creek-Calaveras Creek watershed was the 64,000-acre *Rancho el Valle de San Jose* grant. Agostin Bernal, Juan Pablo Bernal, Antonio Maria Pico Bernal and his wife Maria Pilar Bernal, and Antonio Maria Sunol and his wife Maria Dolores Bernal were the original owners. Antonio Sunol later consolidated his ownership and was apparently the only settler to carry out improvements within the project vicinity. Antonio Sunol’s son, also named Antonio, was the first to actually reside on the land. The Sunol Ranch, constructed circa 1845, was located near the Sunol Water Temple. It consisted of an adobe residence, blacksmith shop, several storehouses, animal corrals, a slaughterhouse, and other outbuildings. The Sunol ranch properties are the only

known historical remains or features associated with this period of occupation within or near the project vicinity.

American Period (1848 – Present)

Following the Mexican-American War (1846-1848) and discovery of gold at Sutter's Mill in January 1848, the influx of gold seekers into San Francisco spilled over into neighboring townships. After California became a state in September 1850, Santa Clara County was organized in 1851 and Alameda County in 1853.

The growth of Santa Clara and Alameda Counties resulted in an almost immediate demand for goods and services, particularly agricultural products. One of the results of the demand for such products was the incursion of settlement into the countryside of both Alameda and Santa Clara Counties. Areas that were initially deemed as marginal for agricultural use became important locations for cultivation – particularly areas that had sources of permanent water. Due in part to the arrival of large numbers of Euro-Americans and the establishment of new farms and ranches, by the late 1860s the Mexican ranchos were quickly disintegrating as a significant social and economic force. As the Gold Rush brought an influx of people to the area, the Bernal family's *Rancho el Valle de San Jose*, for example, gradually gave way to landless American squatters, and portions of the rancho were sold, leased, and expropriated.

An 1876 map of Santa Clara County, drawn by Thompson and West, shows post-Gold Rush ownership and related activity within the project vicinity. By 1876, the entire northern portion of Calaveras Valley watershed lands, encompassing the present-day reservoir, had been purchased or homesteaded. Farms and ranches were widely dispersed throughout the Calaveras Valley, although most of the early American occupation sites appear to be situated on or near the confluence of tributary drainages in the valley. By the mid-1870s, most of the remaining public land in the Alameda Creek watershed had been formally platted and section lines were drawn by the General Land Office (the forerunner of the U.S. Geological Survey).

The Euro-American settlers who purchased acreage within the project vicinity and Study Area were an economically and culturally diverse group that reflected the worldwide movement of people into California following the Gold Rush. These included individuals such as David Williams, born in New York in 1822 and listed as a farmer; his brother Thomas Williams, born in 1825, residing in San Jose by 1880 and listed as a soda manufacturer; and Patrick Murray, an Irish immigrant who arrived in America in 1851. Other settlers included Michena Brandt, who arrived in the United States from Germany in 1868, and Edward McLaughlin, born in 1830 in Pennsylvania and listed as a banker residing in San Jose by 1870.

In general, historic documentation related specifically to the project vicinity and the Study Area prior to 1900 is sparse; however, historic maps, census records, homestead patents, and other

archival sources have provided information regarding the settlement patterns and agricultural history as well as socioeconomic information on the individuals and families who occupied the valley. Local county histories devote less than a page to the area, and recent histories barely mention the region's 19th century historic context. The area's agricultural history is not well documented, nor is the socioeconomic history of the individuals and families who lived in the valley.

Acquisition and Water Development in Calaveras Valley (1870s - Present)

The first water supply to replace early and relatively simple water delivery systems in San Francisco, which included water carts, was developed by the San Francisco Water Works, taking water from Lobos Creek on the southwest border of the Presidio in 1858. Spring Valley Water Company (SVWC) emerged during the late 1850s. Having taken possession of most of the San Francisco Water Works delivery system, in 1866 the company completed Pilarcitos Dam on the Peninsula in San Mateo County, storing 1 billion gallons of water. This was followed by construction of San Andreas Dam near Millbrae, storing 6 billion gallons, in 1870, and construction of Upper Crystal Springs Dam south of the San Andreas Dam, storing 5 billion gallons, in 1877. Eventually Lake Merced, a natural lake fed by springs in the southwest corner of San Francisco, was connected to the water delivery system by a series of pumps. Further improvements occurred in 1888, with the construction of Lower Crystal Springs Dam, which flooded the downstream face of the Upper Dam.

SVWC began to develop sources in Alameda County, beginning in the mid-1870s, as an additional source of supply for San Francisco. The company's first acquisition was Niles Dam on lower Alameda Creek,¹ which was followed by construction of the first pipeline across San Francisco Bay in 1888, an important engineering achievement for the time. In 1898 the company began development of the Pleasanton Wells, and in 1900 completed the Sunol Filter Beds, Dam and Aqueduct on Alameda Creek in Sunol Valley, north of the Study Area.² The classically inspired Sunol Water Temple (built 1910, designed by Willis Polk) marks the convergence of these water sources.

During this period, SVWC began to buy land in the Calaveras Valley floor and surrounding hills, with the purchase of approximately 435 acres of watershed along Calaveras Creek in 1875. Additional purchases occurred in 1876 and in 1887. In 1902 SVWC acquired a large tract of land encompassing another part of the Calaveras Creek watershed from Crocker & Dillon, totaling over 2,000 acres. Demand for water in the company's service area continued to grow during this period, and the company began planning what became its last major water development project,

¹ Niles Dam was recently demolished by the SFPUC.

² Sunol Dam was recently demolished by the SFPUC.

construction of a dam at the north end of the Calaveras Valley to store the waters of Arroyo Hondo and Calaveras Creeks.

SVWC began construction of Calaveras Dam in the summer of 1913, when its crews began clearing the dam site. The type of dam chosen, hydraulic fill, was built by forming two parallel embankments of semi-pervious and pervious material, between which was poured a puddle core of a slurry of fine clay and silt mixed with water. The center consolidated and water was, essentially, squeezed out and a solid, impervious clay core left in place. In addition to the dam, SVWC also constructed a residence for the watershed keeper on what would become the east shore of Calaveras Reservoir. The residence area included two houses and at least one outbuilding.

At the time that SVWC was considering and constructing Calaveras Dam, the City and County of San Francisco had a campaign to purchase and municipalize the water company. City Engineer M.M. O'Shaughnessy monitored the planning and construction of Calaveras Dam, as it would eventually be part of the City's system. O'Shaughnessy strongly expressed concern over "sloppy" work and objected to the "flippant manner in which the young college boys in charge of the work and Mulholland, with his swollen ideas of accomplishment, have undertaken this very serious project" (O'Shaughnessy 1913).

Research in the City's building plans did not reveal who designed the outlet tower in the reservoir and the bridge leading to it, although the names of T.W. Espy and I.S. Flaa, an SVWC engineer, appear on surviving detail sheets; the company's publications simply noted that "the tower was styled in reminiscence of the Sunol Water Temple." The company also noted that the arched facing of riprap on the dam was "designed to prevent sloughing of the earth." When the dam was completed in 1925, SVWC recorded Calaveras Dam to be 220 feet high and containing the runoff from 100 square miles of watershed with a net capacity of 32.8 billion gallons. At that time, it was reported to be "one of the big earth-fill dams of the world."

On March 24, 1918, the arched upstream face of the dam sloughed off and destroyed the outlet gate tower. Some 800,000 cubic yards of the material flowed into the reservoir, which was partially filled. A 1918 engineering study indicated that the dam had not been properly compacted, which left voids in the structure that caused the upstream face to collapse.

Reconstruction of the dam occurred between September 1921 and November 1925, led for most of that time by long-time SVWC employee and construction engineer T.W. Espy. The rock for the new structure was excavated on the hillside downstream from the dam, and earth was deposited on either side of the compacted clay core. The company hired its own work crews and employed contractors to build the dam. A tent-and-platform work camp, with ten 14-man bunkhouses, dining rooms, store rooms, kitchens, and wood/coal sheds, was located on the hillside west of the dam, and SVWC refurbished several existing buildings in the valley to house

its workers. In all, the worker's camp had room for 650 men. It also built a structure and refurbished two old buildings for its engineering and office staff on site. All of these structures have been demolished.

O'Shaughnessy, as noted above, believed that Calaveras Dam would be an important addition to the San Francisco water supply system until water from Hetch Hetchy became available. The collapse and repairs pushed the completion date back to 1925, with the result that water in Calaveras Reservoir was available for only 9 years before water from Hetch Hetchy began to flow in the City's water system, although SVWC was able to release some water stored in the dam for diversion at the Sunol Filter Galleries beginning in early 1916 following closure of the gates on the dam while it was under construction. Even after the dam's reconstruction, the additional supply it provided was insufficient, by itself, to ensure enough water for the City's service area. This limited Calaveras Dam's impact on the City's water system.

Although Calaveras Dam was large for its type, it had limited engineering significance when completed in 1925. Earthfill dams were common by the 1920s. The relative engineering qualities of earthfill dams in California can be assessed, in part, through information from the state's Department of Water Resources, Division of Safety of Dams (DSOD). DSOD records indicate that there are many earthfill dams in California, with more than 70 percent of dams under its jurisdiction of this type. Collectively, all of these dams serve important functions, and the dams obviously benefited the state's urban areas and agriculture. There were also many dams of a similar type to Calaveras Dam in California during the early 20th century. Of the 811 earthfill dams under the jurisdiction of the state in the 1950s, for example, 197 were built prior to 1936, some dating to as early as 1850 and 1851.

Calaveras Dam has been noted as the once tallest earthfill dam in the world; however, achievements such as being the tallest dam of its type have been fleeting at best, and all such dams were soon surpassed by other similar structures. Calaveras Dam was only slightly taller than several other similar structures built at that time, such as Upper San Leandro Dam, a 190-foot-tall hydraulic-fill dam built in 1926; Lake Arrowhead's hydraulic fill dam, built in 1922 to 190 feet; and the City of Los Angeles' Stone Canyon Dam, built of earth in 1925 to a height of 185 feet. Some earlier dams of similar construction were also large, such as Druid Lake Dam. Built in 1871 near Baltimore, this dam was an "early earthfill dam in the U.S. exceeding 100 feet in height; features puddle core of clay," like Calaveras Dam. The American Society of Civil Engineers (ASCE) considers Druid Lake Dam a National Civil Engineering Historic Landmark. Other early earth-fill dams include the Belle Fourche Dam in South Dakota, built in 1911 with a structural height of 36 feet. It was considered "the world's largest homogenous, rolled earth-fill dam" when it was completed. After Calaveras Dam was completed, subsequent dams claimed the achievement of being the tallest of this type. El Capitan Dam in San Diego County, for example, was described as the largest earthfill dam in the world in 1934. San Gabriel #1 was an earth and

rock dam built in 1938 to a height of 320 feet. The ASCE noted that eastern Montana's Fort Peck Dam was "the world's largest earthen dam" in 1940. Denison Dam, built in 1943 on the border between Texas and Oklahoma, according to the ASCE, was, "when built, the largest rolled earth-fill dam in the U.S." Nothing in the accounts of Calaveras Dam's construction suggests that it was designed and built through anything other than standard construction methods of the time.

Over time, Calaveras Reservoir eventually developed into a substantial component of the City's water system. It delivered water to San Francisco through Niles Canyon Aqueduct and Bay Division Pipeline No. 1, which was built by the City in 1925 to carry Hetch Hetchy water once it became available, and ran across the southern end of San Francisco Bay. The City built Bay Division Pipeline No. 1 as part of the Hetch Hetchy project, but, as noted above, SVWC leased the pipeline for delivery of Calaveras water to Crystal Springs under a Railroad Commission order negotiated by San Francisco's engineers and attorneys during the period before Hetch Hetchy water was ready to flow through the system. In anticipation of Calaveras Reservoir's expected role in the water system, in conformance with the Railroad Commission ruling, and to convey the additional yield from Calaveras Reservoir to San Francisco, SVWC enlarged the Sunol Aqueduct in Niles Canyon to carry 70 million gallons per day (mgd) in 1924, and also built Niles Regulating Reservoir and Niles/Irvington Pipeline and Pump Station to boost Calaveras Dam and Sunol Filter Bed water into Bay Division Pipeline No. 1.

In 1930, SVWC transferred its properties and facilities to the City, which proceeded to modify and improve the facilities at Calaveras Dam and Reservoir. In 1931, the City completed construction of the Upper Alameda Creek Diversion Dam and tunnel. This additional dam and tunnel diverted water from Alameda Creek which is situated northeast of Calaveras Reservoir. The structure added 35 square miles to the watershed tributary to Calaveras Reservoir. This addition to the system was planned and begun by SVWC as an original part of the Calaveras complex. Although SVWC had considered and designed a structure at this location in the 1910s and 1920s, and began constructing the Alameda Creek diversion dam tunnel in 1925 following completion of Calaveras Dam, the City completed the designs and construction of the project. This small dam and tunnel was a relatively minor addition to the City's overall water system at this time when the City was simultaneously completing major infrastructural elements of the system to deliver Hetch Hetchy water, such as the Foothill Tunnel, San Joaquin Pipeline, and Coast Range Tunnel.

Other immediate changes to the Calaveras Dam complex included construction of a pipeline in 1934 to directly connect Calaveras Reservoir to the overall system rather than running its water down Calaveras Creek / Alameda Creek to the Sunol gravel beds (the Sunol infiltration galleries remain in place today), and in 1935, the City built an aerator facility at the north foot of the dam to help reduce the turbidity of Calaveras water. The City also added riprap to the lower portions of the south face of the dam, and in 1939, the City rebuilt the lower spillway, extending it

northward, to help reduce the erosion in Calaveras Creek caused by large flows coming off the spillway. The City's initial improvements to the Calaveras Dam were largely complete by 1940.

During the late 1950s and early 1960s, the old dam keeper's residence and associated outbuildings, with the exception of one barn, were demolished and replaced with the current Ranch Style residences. In 1975, the dam underwent major seismic retrofitting. The original arched schist talus face of the dam was covered when the crest of the dam was widened from 50 feet to 69 feet and the height was raised. The amount of material added to the face of the dam was significant, and created a new dam crest on the upstream side. Additional modifications were made in the early 1990s, when a new but identical sized pipeline replaced the original Calaveras pipeline and the 1935 aerator and aerator building were demolished.

Following alterations in the SFPUC's system in the latter half of the 20th century, water from Calaveras Reservoir no longer flows to the City's system via the Water Temple and Sunol Aqueduct. It is now conveyed through the Sunol Valley Water Treatment Plant (erected in 1966) and into the Hetch Hetchy Aqueduct west of the Coast Range Tunnel. Currently, the SFPUC Alameda watershed lands are not open to the public, although the watershed lands have been leased to various individuals and organizations for cattle grazing and other purposes, and Calaveras Road is a public road.

Calaveras Test Site (1948-1972)

One of the uses on the watershed land on the southern end of the Calaveras Reservoir in Santa Clara County during the latter half of the 20th century was the 3.2-acre Calaveras Test Site. From 1948-1972, the San Francisco Water Department (SFWD) (under the SFPUC) leased the land to Stanford Research Institute (SRI). It was one of SRI's many facilities in California. SRI, headquartered in Menlo Park, is a non-profit research institute engaged in engineering, physical and life sciences, and economic research for both civilian and government agencies. SRI, founded at Stanford University in 1946, was established to conduct research with broad applications in support of industry and business. Over time, SRI expanded its research into multiple physical and social scientific areas, along with work to assist the government in areas related to national defense. It is now an independent entity no longer directly affiliated with Stanford University.

SRI leased a portion of the land to conduct research operations. By 1958, SRI leased additional acreage and constructed buildings to support high explosive and propellant research, testing, and manufacturing. Building 7, a storeroom, laboratories, a burn pit, septic tank, a 65,000-gallon underground fire protection water tank and a 1,500-gallon underground diesel storage tank were built at this time.

From 1972-1982, the property was subleased to TransTechnology Corporation, which operated at the site under the name Space Ordnance Systems, to design and manufacture small detonating devices and primer cord, storing powders and solids and performing degreasing operations. Quantic Industries purchased Space Ordnance Systems in 1982 when TransTechnology relocated to Delaware. In 1982, Quantic Industries obtained a new lease directly from SFWD that included the use of Building 7 and the surrounding area for the testing and manufacturing of small detonating devices and primer cord. The site was flooded in 1985/1986 when the underground fire protection water tank overflowed. Rincon-Vitoa Insectaries Inc., a company that produces and distributes insects and other organisms for pest control, leased the southern portion of the site in 1982, for use as a biological control production plant. Quantic Industries operated the facility until they ended their lease in 1993. Currently, the former Calaveras Test Site is abandoned and portions of that site are used for cattle grazing. Select buildings and structures have been demolished and removed from this property over time, including Building 7.

4.10.1.3 REGULATORY FRAMEWORK

Subsection 4.10.1.3 Contents

Federal

- National Historic Preservation Act as Amended (1966)
- National Register of Historic Places, Criteria for Evaluation

State

- California Code of Regulations, Title 14, Section 4307
- California Public Resources Code Sections Protecting Paleontological Resources
- California Register of Historical Resources
- California Environmental Quality Act Statute and Guidelines

Local

- City and County of San Francisco
- County of Alameda
- County of Santa Clara

The Calaveras Dam Replacement Project would take place entirely within SFPUC lands. As discussed in Section 3.7, Discretionary Approvals and Agencies Involved, in Chapter 3, Project Description, it would require permits from federal, state, regional, and local (City and County of San Francisco, County of Alameda, and County of Santa Clara) agencies. The primary regulatory framework directing the treatment of historical resources includes laws such as the National Historic Preservation Act of 1966 (NHPA, with implementing regulations at 36 CFR 800), the National Environmental Policy Act of 1969, and CEQA. Collectively these laws, regulations, and guidelines establish a comprehensive program for the identification, evaluation, and treatment of cultural resources. Relevant sections of each are presented below. The Lead Agency for the CDRP's CEQA compliance is the San Francisco Planning Department and the federal Lead Agency responsible for compliance with Section 106 of NHPA is the U.S. Army Corps of Engineers (USACE).

Federal

National Historic Preservation Act as Amended (1966)

NHPA requires federal agencies to consider the effects of their undertakings (such as issuing permits) on historic properties and to give the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on those undertakings. The lead federal agency will be responsible for project compliance with Section 106 of the NHPA and its implementing regulations, set forth by the ACHP at 36 CFR 800.

National Register of Historic Places, Criteria for Evaluation

The National Register or NRHP is the nation's master inventory of cultural resources worthy of preservation. It is administered by the National Park Service, which is represented at the state level by the State Historic Preservation Officer (SHPO). The National Register includes listings of buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the federal, state, or local level. Resources that are listed on or have been found by SHPO to be eligible to the National Register are called historic properties. The National Register criteria and associated definitions are outlined in National Register Bulletin Number 15: How to Apply the National Register Criteria for Evaluation (NPS 2005). The National Register includes four evaluative criteria to determine eligibility of a resource, in accordance with the regulations outlined in 36 CFR 800, which are identified at 36 CFR 60.4:

The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

- a. that are associated with events that have made a significant contribution to the broad patterns of history; or
- b. that are associated with the lives of persons significant in our past; or
- c. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- d. that have yielded or may likely yield information important in prehistory or history.

Although there are exceptions, certain kinds of resources are not usually considered for listing in the National Register: religious properties, moved properties, birthplaces and graves, cemeteries, reconstructed properties, commemorative properties, and properties that have achieved significance within the past 50 years.

Evaluation of a resource in relation to the National Register criteria must consider and clearly state the significance of that resource to American history, architecture, archaeology, engineering, or culture. A resource may be considered eligible for listing on the National Register if it meets one or more of the above-listed criteria for significance and possesses integrity. Historic properties must retain their integrity to convey their significance. Although the evaluation of integrity is sometimes a subjective judgment, it must always be grounded in an understanding of the resource's physical features and how they relate to its significance. The National Register recognizes seven aspects or qualities that define integrity, as outlined in Bulletin 15:

- **Location.** The place where the historic property was constructed or the place where the historic event occurred.
- **Design.** The combination of elements that create the form, plan, space, structure, and style of a property.
- **Setting.** The physical environment of a historic property.
- **Materials.** The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- **Workmanship.** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- **Feeling.** A property's expression of the aesthetic or historic sense of a particular period of time.
- **Association.** The direct link between an important historic event or person and a historic property.

Resources either retain integrity (this is, convey their significance) or they do not. To retain historic integrity a property will always possess several of the aspects listed. The retention of specific aspects of integrity is paramount for a property to convey its significance (NPS 2005, p. 44).

State

Under CEQA, cultural resources include objects, sites and districts, historic buildings and structures, cultural landscapes, and sites and resources of concern to local Native American or other ethnic groups. Compliance procedures are set forth in the CEQA Guidelines California Code of Regulations (CCR), Sections 15064.5 and 15126.4. The primary applicable state laws and codes are presented below.

California Code of Regulations, Title 14, Section 4307

Under this state preservation regulation, no person shall remove, injure, deface or destroy any object of paleontological, archaeological, or historical interest or value.

California Public Resources Code Sections Protecting Paleontological Resources

Several sections of the California Public Resources Code (PRC) protect paleontological resources. Section 5097.5 prohibits “knowing and willful” excavation, removal, destruction, injury, and defacement of any paleontological feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted permission. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands.

California Register of Historical Resources

The California Register of Historical Resources (CRHR) is the authoritative guide to the state’s historical and archaeological resources significant within the context of California’s history. Criteria for eligibility for inclusion in the California Register are based on, and therefore correspond to, National Register of Historic Places criteria for listing. Under PRC Section 5024.1, an historic resource is eligible for listing in the CRHR if it:

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (“Events”);
2. Is associated with the lives of persons important in our past (“Persons”);
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values (“Architecture/Construction”); or
4. Has yielded, or may be likely to yield, information important in prehistory or history (“Information Potential”).

California Environmental Quality Act Statute and Guidelines

When a proposed project may cause a substantial adverse change to an historical resource, CEQA requires the lead agency to carefully consider the possible impacts before proceeding (PRC Section 21084 and 21084.1). CEQA equates a substantial adverse change in the significance of a historical resource with a significant effect on the environment (PRC Section 21084.1). The Act explicitly prohibits the use of a categorical exemption for projects which may cause such a change (PRC Section 21084).

A “substantial adverse change” is defined in Guidelines Section 15064.5(b) as “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired.” Furthermore, the “significance of an historic resource is materially impaired when a project “demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for inclusion in the

California Register of Historical Resources;” or “demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources...” or “demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.”

CEQA effectively requires preparation of a mitigated Negative Declaration or an EIR whenever a project may adversely impact historical resources. Current CEQA law provides that an EIR must be prepared whenever it can be fairly argued, on the basis of substantial evidence in the administrative record, that a project may have a significant effect on a historical resource (Guidelines Section 15064). A mitigated Negative Declaration may be used where all potentially significant effects can be mitigated to a non-significant level (Section 21080). For example, a mitigated Negative Declaration may be adopted for a project that meets the Secretary of the Interior’s Standards for Rehabilitation and local historic preservation regulations, and so would not adversely affect the resource.

For the purposes of CEQA (Guidelines Section 15064.5), the term “historical resources” includes the following:

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing the California Register of Historical Resources (Public Resources Code Section 5024.1; Title 14 CCR, Section 4850 et seq.).
2. A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, may be considered to be an historical resource, provided the lead agency’s determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be “historically significant” if the resource meets the criteria for listing in the CRHR (Public Resources Code Section 5024.1, Title 14 CCR, Section 4852) as follows:
 - i. Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage;
 - ii. Is associated with the lives of persons important in our past;

- iii. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
 - iv. Has yielded, or may be likely to yield, information important in prehistory or history.
4. The fact that a resource is not listed in, or determined to be eligible for listing in the California Register of Historical Resources, not included in a local register of historical resources (pursuant to section 5020.1(k) of the Public Resources Code), or identified in an historical resources survey (meeting the criteria in section 5024.1(g) of the Public Resources Code) does not preclude a lead agency from determining that the resource may be an historical resource as defined in Public Resources Code sections 5020.1(j) or 5024.1.

Thus, under CEQA Guidelines Section 15064.5(a)(3), even if a resource is not included in any local, state or federal register, or identified in a qualifying historical resources survey, a lead agency may still determine that a resource is a historical resource for the purposes of CEQA. A lead agency shall consider a resource to be historically significant if it finds that the resource meets the criteria for listing in the California Register. Such a determination must be supported by substantial evidence in light of the whole record.

Under CEQA (PRC Section 15064.5), “generally, a project that follows the Secretary of the Interior’s Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings or the Secretary of the Interior’s Standards for Rehabilitation with Guidelines for Rehabilitating Historic Buildings shall be considered as mitigated to a level of less than a significant impact on the historical resource.”

Impacts to “unique archaeological resources” are also considered under CEQA, as described under PRC Section 21083.2. If an archaeological site does not meet the criteria for inclusion on the CRHR but does meet the definition of a unique archaeological resource as outlined in the PRC (Section 21083.2), it is entitled to special protection or attention under CEQA. A unique archaeological resource is an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets one of the following criteria:

- The archaeological artifact, object, or site contains information needed to answer important scientific questions, and there is a demonstrable public interest in that information;
- The archaeological artifact, object, or site has a special and particular quality, such as being the oldest of its type or the best available example of its type; or
- The archaeological artifact, object, or site is directly associated with a scientifically recognized important prehistoric or historic event or person.

A non-unique archaeological resource indicates an archaeological artifact, object, or site that does not meet the above criteria. Impacts to non-unique archaeological resources and resources which do not qualify for listing on the CRHR receive no further consideration under CEQA.

Under CEQA Section 15064.5, an archaeological resource shall first be evaluated as a potential historical resource. A project potentially would have significant impacts if it would cause substantial adverse change in the significance of one of the following:

- An archaeological resource defined as either an historical resource (i.e., eligible for the CRHR) or a unique archaeological resource,
- A unique paleontological resource or unique geologic feature (i.e., where the project would directly or indirectly destroy a site or resources), or
- Human remains (i.e., where the project would disturb or destroy burials).

Sections 15065.4(e)(1) and (2) of the CEQA Guidelines provides the following guidance with regard to the accidental discovery of human remains:

In the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:

1. There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:
 - A. The coroner of the County must be contacted to determine that no investigation of the cause of death is required, and
 - B. If the coroner determines the remains to be Native American:
 - i. The coroner shall contact the Native American Heritage Commission within 24 hours.
 - ii. The Native American Heritage Commission shall identify the person or persons it believes to be the most likely descended from the deceased Native American.
 - iii. The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or
2. Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.
 - A. The Native American Heritage Commission is unable to identify a most likely descendent or the most likely descendent failed to make a recommendation within 48 hours after being notified by the commission;

- B. The descendent identified fails to make a recommendation; or
- C. The landowner or his authorized representative rejects the recommendation of the descendent, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

Local

City and County of San Francisco

The Study Area is outside of the areas covered by adopted San Francisco registers (Article 10 and Article 11 of the San Francisco Planning Code, and *Here Today*) and other local surveys of historical resources (including the 1976 Architectural Survey, and the Heritage Survey).

Planning Code Section 101.1 is generally applicable to the proposed project. It requires that the City find that the proposed project is consistent, on balance, with eight Master Plan Priority Policies. Among the Priority Policies is Priority Policy 7, “that landmarks and historic buildings be preserved.”

The *San Francisco General Plan* currently contains no Preservation Element. The Planning Department has recently released a Draft Preservation Element for comment by the Landmarks Preservation Advisory Board and the public (City and County of San Francisco Planning Department 2007). The Draft Preservation Element contains objectives and policies that encourage the protection and preservation of historic architectural resources and archaeological sites:

- *Objective 2:* Protect and Preserve Historic Resources.
- *Objective 3:* Preserve archaeological resources within San Francisco as a unique, irreplaceable record of the past.
- *Policy 3.2:* Ensure preservation or appropriate treatment of inadvertently discovered archaeological resources.

County of Alameda

As explained in Subsection 4.2.4, Other Jurisdictions’ Land Use Plans and Policies, in Section 4.2 Plans and Policies, the proposed project would not be legally bound to Alameda or Santa Clara County’s planning and building policies. Nevertheless, the SFPUC seeks to work cooperatively with local jurisdictions where SFPUC-owned facilities are located outside of San Francisco to avoid conflicts with local building laws and zoning codes. No resources within the Study Area are currently included in a local County of Alameda register of historical resources (URS 2005).

Alameda County policies relevant to cultural resources in the *East County Area Plan* (County of Alameda 1994) include the following:

- *Policy 136:* The County shall identify and preserve significant archaeological and historical resources, including structures and sites which contribute to the heritage of East County.
- *Policy 137:* The County shall require development to be designed to avoid cultural resources or, if avoidance is determined by the County to be infeasible, to include [and] implement appropriate mitigation measures that offset the impacts.

County of Santa Clara

No resources within the Study Area are currently included in the local register of historical resources (Santa Clara County “Heritage Resources Inventory”) (URS 2005).

Santa Clara County General Plan (County of Santa Clara 1994) policies relevant to cultural resources within unincorporated Santa Clara County include the following:

- *Policy R-RC 88:* For projects receiving environmental assessment, expert opinions and field reconnaissance may be required if needed at the applicant’s expense to determine the presence, extent, and condition of suspected heritage resources and the likely impact of the project upon the resources.

4.10.1.4 METHODS FOR IDENTIFYING CULTURAL RESOURCES

Subsection 4.10.1.4 Contents

Documentary Research

California Historical Resources Information System Records Search

Title Search

Archival Collections

Review of Previous Cultural Resources Studies

Historic Registers

Field Reconnaissance

Native American Contacts

Public Outreach

This section presents the methods for identifying and evaluating the cultural resources within the Study Area under NRHP criteria to provide information that USACE may use as part of the Section 106 process. This section will also identify the potential historical resources within the Study Area that may be affected by the proposed project. As discussed above, even if a resource is not included on any local, state, or federal register, it may still be considered an historical resource for the purposes of CEQA if the lead agency determines, based on substantial evidence, that the resource meets the CRHR criteria.

Methods used to identify and obtain information about cultural resources in the Study Area include documentary research, field reconnaissance, outreach to Native American groups, and public outreach, as described below.

Documentary Research

Between March and June 2006, ART, conducted a literature review and an archaeological survey to identify and evaluate the Study Area for significant historic-era and prehistoric archaeological resources. This investigation also assessed potential impacts to these resources and updated the records of archaeological sites and features previously documented within the Study Area.

California Historical Resources Information System Records Search

ART reviewed an earlier records search conducted in 2003 and 2004 by URS Corporation (URS) (File Number 03-270 and 04-194) at the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS). These records searches included the area around Calaveras Reservoir encompassing the Study Area for the project.³ The NWIC records search found no listings of resources within the greater project area (including the current Study Area) under the Office of Historic Preservation Historic Properties Directory, and that there are no listings under the California Inventory of Historical Resources (NWIC 2004). The records search attached copies of General Land Office (GLO) Plat Maps for 1866, 1867, 1868, and 1872 (showing houses), and USGS maps for 1895 and 1904.

The URS records searches found no record of a comprehensive cultural resources survey for the Study Area. The records searches identified the following architectural resources, all dating between around 1900 and 1925, within one mile of the Study Area: Calaveras Dam Structure; Calaveras Dam adit tower; Calaveras Dam spillway; Calaveras spillway bridge; Calaveras Dam filtration plant complex; Calaveras Dam watershed keeper's complex and barn; and the "Blue Stone House." No recordation of these resources is on file at the NWIC and none were previously evaluated for their eligibility for listing in the NRHP or CRHR.

Title Search

ART conducted research at the Assessor's and Recorder's offices for both Alameda and Santa Clara counties to examine property records of the Study Area related to land ownership and operations before SVWC consolidated ownership of the Study Area and before its acquisition by the City of San Francisco in 1930. Regarding the relevant Study Area Assessor's Parcel Numbers (APN) 029-39-002, -003, -004, -005 (immediately south of Alameda/Santa Clara border), 029-40-001, -002 (southern extent of Calaveras Reservoir), and 42-02-005, -006, -007 (east of the Arroyo Hondo), the only record available at the Santa Clara County office is dated 1 January 1973 and refers to ownership of the San Francisco City/SFPUC Commercial Land

³ The records search covered the current Study Area within a larger area of study: a 1-mile search radius surrounding the Calaveras Dam structure, a 1-mile search radius centered on the south margin of Calaveras Reservoir, a ¼-mile radius search of the Calaveras Pipeline between the dam and the Sunol filtration plant and the Alameda Creek Diversion Dam and tunnel portal, two road realignment study areas, and a maximum 900-foot contour inundation area.

Bureau/Director. The database was created in 1973, and no information prior to this date has survived. Similarly, the County of Alameda offices were unable to provide any property ownership data prior to the present-day owner, the City of San Francisco.

Archival Collections

To further investigate the history of ownership and settlement activity in Calaveras Valley, ART conducted research at the University of California Bancroft Library, the San Jose Public Library and the San Jose State University Library's California Room. ART examined historic maps, local histories, census records, a directory from Milpitas, the nearest town, to gain information regarding the individuals and the homesteads highlighted through the General Land Office (GLO) sites 1-12 (numbered sites previously identified in the vicinity of the Study Area by URS from historic GLO maps (URS 2003, 2005).

Review of Previous Cultural Resource Studies

ART reviewed previous cultural resources studies that included areas in the Study Area for this project. In 1994, the SFPUC sponsored an investigation of Alameda watershed's natural and cultural resources. Environmental Science Associates (ESA) prepared that report, which included presentation of historical background, archival research, and a "windshield survey" (ESA 1994). The ESA research reviewed books, reports, records and maps, manuscripts book available at the California Archaeological Inventory Northwest Information Center at Sonoma State University in Rohnert Park, the University of California Bancroft Library in Berkeley, and the Doe Library Map room in Berkeley. The ESA report and management plan did not record or inventory any previously unknown cultural resources.

In 2003 and 2005, URS completed two cultural resources reports that encompass the Study Area for this project for geotechnical field investigations required for the design of the CDRP. URS recorded 12 archaeological resources, 5 of which lie within the current Study Area (URS 2003, 2005):

- Historic Era Stone Wall Site (P-01-010676);
- Historic Era Debris Scatter Site (P-01-010675);
- Historic Era Adits (P-01-010674);
- Historic Era Corral Site (P-43-001606); and
- Possible Prehistoric Chert Quarry Site (P-43-001600).

URS also noted potential historic activity areas from an 1866 GLO plat map which identified 12 homestead sites in Calaveras Valley (URS 2005). The map depicts buildings and provides family names associated with these dwellings. ART's field investigation determined that all of these potential sites that occur within the current Study Area now lie submerged below the current

reservoir water level. ART was therefore unable to confirm their presence or absence. Since the project would not result in reductions of reservoir water levels sufficient to expose these potential resources, they are omitted from further analysis.

URS (URS 2005) reviewed a confidential memorandum, dated November 30, 2001 (Citation Withheld) regarding research conducted at the Bancroft Library at the University of California, Berkeley for information on the construction and reconstruction of the Calaveras Dam. The confidential memorandum cites a 1915 letter from M.M. O'Shaughnessy, City Engineer for the City and County of San Francisco Department of Public Works, and S.P. Eastman of the Spring Valley Water Company, in which O'Shaughnessy conveys a request from E.W. Gifford, Curator, Department of Anthropology at the University of California Museum in San Francisco to obtain "historic skeletons and finds" made during excavations for the Calaveras Dam. No information was found by the memorandum's author regarding the exact location of the discovered skeletons and "finds." In the opinion of the author of the memorandum, it is likely that the artifacts were unearthed at one of several borrow sites for the dam. Much of this clay material sluiced into the center of the dam using a system of high-pressure flumes and ditches. On November 5, 2004, URS archaeologist, Sean Dexter, contacted the Curator of the Phoebe A. Hearst Museum (at the University of California, Berkeley) to inquire about any materials the museum might have in its collections from the excavation of Calaveras Dam. The curator indicated that she was unaware of any such material housed at the Phoebe Hearst Museum. Although the archaeological site from which the materials referred to by O'Shaughnessy was disturbed and/or removed during construction of the existing Calaveras Dam, its current location, extent, and integrity are unknown. If any remnant of this resource exists within the Study Area, it is presumed to be eligible for listing on NRHP/CRHR.

Historic Registers

In addition to ART's assessment of previous surveys in and around Calaveras Reservoir, JRP consulted the standard sources of information that list and identify known and potential historical resources to determine whether any buildings, structures, objects, districts or sites had been previously recorded or evaluated in or near the Study Area. JRP reviewed the NRHP, Office of Historic Preservation Determinations of Eligibility for the NRHP, California Inventory of Historic Resources, California Historic Landmarks, and California Points of Historical Interest. None of the registers or lists identified resources in the Study Area.

Field Reconnaissance

Between May and June 2006 a team of ART archaeologists, under Geoarchaeologist Philip Kaijankoski, MA, conducted an intensive pedestrian survey to identify and document any unrecorded historic-era or prehistoric cultural resources within the Study Area. Additionally, site visits to all previously recorded cultural resources within the Study Area were conducted to

review the condition of those resources and the adequacy of their documentation, and (in several cases) to update site documents.

While the entire Study Area was examined for cultural resources, some areas were not systematically covered due to safety reasons (such as very steep slopes) or extremely dense vegetation that obscured the ground surface. While no subsurface sampling was performed, every attempt to view bare ground surface was undertaken, including the inspection of rodent burrows, cut banks, and areas of disturbance, and clearing vegetation in selected areas that appeared sensitive for archaeological sites. All exposed bedrock was examined for prehistoric milling activity and rock art. Specific survey techniques and problems encountered, if any, of each survey area are discussed below.

The Study Area south of Calaveras Reservoir is characterized by hill slopes, alluvial fans, and the floodplain of Calaveras Creek. An approximately 200-meter-diameter area located to the southeast of the reservoir was not surveyed due to impenetrable brush. The remainder of this area was surveyed utilizing 30-meter transects. Ground visibility in this area ranged from excellent (immediately south of the reservoir) to poor (within un-grazed pastures). The Study Area along the reservoir's western and eastern shores (the "fluctuation zone") is characterized by finger ridges, steep drainages, and alluvial fans. Due to wave activity, most of the areas near the reservoir have been eroded to some extent. On the more gently sloping areas, however, it appears that a significant amount of deposition of fine grained sands and silts from the reservoir has occurred, potentially covering and preserving subsurface archaeological deposits.

The most effective manner to survey the bathtub ring was to contour the slopes, which was also undertaken at 30-meter intervals. Particular attention was paid to the alluvial fans at the mouth of the drainages and the tops of the ridges. Ground visibility within this portion of the Study Area ranged from excellent along the eroded slopes extending into the reservoir and drainages (which were highly eroded due to cattle grazing), to poor on the ridges and alluvial fans (due to ground cover).

Kayaks provided an effective manner to survey the steep hillsides of Arroyo Hondo. At culturally sensitive landforms and any flat areas, the kayaks were dismantled and the area was inspected by pedestrian reconnaissance. The Study Area north of the existing dam proved to be difficult terrain to survey in strict 30-meter transects. Areas characterized by narrow contours immediately northeast of the dam were too dangerous to cover intensively. (It is important to note also that steep terrain generally decreases the cultural sensitivity of a given area.) In this steep area, ridges were walked so that virtually the entire hillside was visually inspected from a safe distance.

The area below the dam within the Calaveras Creek drainage was covered intensively during investigation of the historic Calaveras Dam complex. Since there was a very low likelihood of

encountering historical resources, the steep hill located immediately northwest of the dam (Observation Hill) was either visually inspected or surveyed in 30-meter transects contouring the landform. Additionally, portions of Calaveras Road that may be impacted by project-related activities were surveyed for cultural resources. Both sides of the road were inspected, and many flat areas adjacent to the road were covered intensively.

During field reconnaissance, ART archaeologists recorded 27 cultural features. ART also re-visited and re-documented site P-43-001600, previously identified by URS (URS 2003, 2005). Some of these features were determined to be isolated finds that do not constitute NRHP- or CRHR- eligible resource categories. Others were determined to be associated with buildings and structures (like the Calaveras Dam, the Calaveras Test Site, and the Alameda Diversion Tunnel) and are recorded and evaluated by JRP as described below. Other features originally identified and recorded by ART now lie outside the current Study Area, which has been refined since the field reconnaissance was conducted. In total, ART's field reconnaissance identified five archaeological resources within the current Study Area:

- Historic-Era Habitation Site (CD 8);
- Historic-Era Habitation Site (CD 10);
- Calaveras Dam Construction Workers' Site (CD 20);
- Prehistoric Bedrock Mortar / Lithic Scatter Site (CD 26); and
- Historic-Era Debris Scatter Site (CD 27).

In September and October 2007, a team from JRP, led by JRP Partner and architectural historian Christopher McMorris, conducted fieldwork in the Study Area to augment and update the survey conducted by ART in 2006. JRP recorded the four historic architectural resources, also referred to as built environment resources, in the Study Area and verified or updated information from the previous recordation. In addition to reviewing the built environment resources that ART inventoried, JRP recorded the Alameda Creek Diversion Dam because SFPUC added the structure to the Study Area following identification of new project features that could result in minor modification of the structure to install a water bypass flow valve.

Native American Contacts

As part of both the CEQA and NHPA Section 106 process, the San Francisco Planning Department has contacted Native American organizations pursuant to 36 CFR 800.2(c)(2)(ii) to seek information about historic properties within the Study Area that may be of religious or cultural importance to Native American organizations and to provide Native American organizations with the opportunity to identify their concerns about the impacts of the project on historic properties. In response to a Planning Department request (City and County of San Francisco Planning Department 2006a), the Native American Heritage Commission (NAHC)

conducted a record search of the sacred land files of the NAHC. The search did not indicate the presence of Native American cultural resources in the immediate project vicinity, although the response from the NAHC notes that “the absence of site information in the sacred land file does not indicate the absence of cultural resources in any project area” (NAHC 2006). The NAHC also provided a list of Native American individuals and organizations that may have interest or knowledge about cultural resources in the vicinity of the project. The Planning Department has sent letters to each of the 11 contacts provided by the NAHC (City and County of San Francisco Planning Department 2006b) and has received one response (Nototomne Cultural Preservation 2006). That response expresses concern for ground disturbance in the vicinity of possible Native American occupation sites and burials, and requests that work be monitored by a Native American monitor and a qualified archaeologist.

Public Outreach

In order to afford local government and other organizations or individuals the opportunity to provide their views regarding the CDRP, and in order to request information about resources that could be affected by the CDRP, the Planning Department sent a letter on July 21, 2006, to 12 agencies, organizations and individuals that may have an interest in, or knowledge about, historic resources within the Study Area (City and County of San Francisco Planning Department 2006c). MEA has not, to date, received any letters in response.

4.10.1.5 KNOWN CULTURAL RESOURCES WITHIN THE STUDY AREA

Subsection 4.10.1.5 Contents

Archaeological Resources

- Historic Era Stone Wall Site (P-01-010676)
- Historic Era Debris Scatter Site (P-01-010675)
- Historic Era Adits (P-01-010674)
- Historic Era Corral Site (P-43-001606)
- Possible Prehistoric Chert Quarry Site (P-43-001600)
- Historic Era Habitation Site (CD 8)
- Historic Era Habitation Site (CD 10)
- Calaveras Dam Construction Workers' Site (CD 20)
- Prehistoric Bedrock Mortar / Lithic Scatter Site (CD 26)
- Historic Era Debris Scatter Site (CD 27)

Historic Architectural Resources

- Calaveras Dam Complex (CD 15)
- Calaveras Dam Keeper's Property (CD 21)
- Alameda Creek Diversion Dam and Tunnel (CD 17)
- Calaveras Test Site (CD 12)

As described above, ART, ETJV, JRP, and URS have undertaken a comprehensive search for information regarding cultural resources within the CDRP Study Area. Methods used to identify

and obtain information about cultural resources in the Study Area include documentary research (including a CHRIS records search, title search, archival collections, review of previous cultural resource studies, and review of historic registers), field reconnaissance, outreach to Native American groups, and public outreach.

Five known archaeological resources have been identified within the current Study Area through review of previous cultural resource studies. Five archaeological sites within the current Study Area were identified through ART field reconnaissance (ETJV 2008). JRP has identified three potential historic architectural resources within the Study Area (JRP 2008), and one potential historic architectural resource (the Calaveras Test Site) that is not within the current Study Area (which, since the time of the cultural resources survey, has been more specifically defined). However, because the Calaveras Test Site is immediately adjacent to the current Study Area, the latter is discussed in this section for informational purposes.

This subsection describes these 14 cultural resources and evaluates their eligibility for inclusion in the NRHP/CRHR.

Archaeological Resources

Historic Era Stone Wall Site (P-01-010676)

Description

This site consists of a low oval stone wall situated at the summit of Observation Hill at the northern end of Calaveras Reservoir. The wall is dry-laid and no artifacts that could be used to imply an age for the wall were noted in the field.

Evaluation

Documentary research, field reconnaissance, outreach to Native American groups, and public outreach have not uncovered any information that would indicate that this feature is associated with any significant event in local, state, or national history. Consequently, it does not appear eligible for listing in the NRHP/CRHR under Criterion A/1 (Events). As research did not connect this feature to individuals important in local, state or national history, it does not appear to be eligible for listing on the NRHP/CRHR under Criterion B/2 (Persons). In addition, this low stone wall does not exhibit important design characteristics for its type or evidence of having been the work of a master; it appears ineligible under NRHP/CRHR Criterion C/3 (Architecture /Construction). Based on field observations (URS 2003), this property does not appear to be associated with any subsurface artifacts or additional features. As such, it does not appear to possess the data potential that could render it eligible for NRHP/CRHR listing under Criterion D/4 (Information Potential).

Historic Era Stone Wall Site (P-01-010676) does not appear to be eligible for listing in the NRHP or CRHR.

Historic Era Debris Scatter Site (P-01-010675)

Description

Located at the northern end of Calaveras Reservoir on Observation Hill, this feature consists of a concentration of historic-era artifacts approximately 20 feet by 20 feet, as well as a 4-foot-by-4-foot patch of asphalt surface. Although none of the artifacts could be used to determine with much specificity the date this site was created, URS archeologists assert that it may be related to the original construction of the reservoir (URS 2003).

Evaluation

Documentary research, field reconnaissance, outreach to Native American groups, and public outreach have failed to uncover any information that indicates this 20th century site is associated with any significant event in local, state, or national history. As such, it does not appear to be eligible for listing in the NRHP/CRHR under Criterion A/1 (Events). Similarly, documentary research could not connect this feature to individuals important in local, state or national history under NRHP/CRHR Criterion B/2 (Persons); the site appears ineligible under this criterion. This site and small section of asphalt paving also does not exhibit important design characteristics for its type or evidence of having been the work of a master. Consequently, this site does not appear eligible to the NRHP/CRHR under Criterion C/3 (Architecture/Construction). URS's field observations indicate that this is a surface site; there is little chance that subsurface artifacts or related features are present. As the historical association of this site is tentative at best, it does not appear to possess the data potential that would render it eligible under Criterion D/4 (Information Potential).

Historic Era Debris Scatter Site (P-01-010675) does not appear eligible for listing in the NRHP or CRHR.

Historic Era Adits (P-01-010674)

Description

This feature, located above Calaveras Creek to the north of the dam, is one of several adits that may be related to dam construction or early geotechnical exploration.

Evaluation

Although this feature may be related to the construction of the Calaveras Dam, documentary research, field reconnaissance, outreach to Native American groups, and public outreach have not uncovered any information that would indicate that this feature is definitively associated with any significant event in local, state, or national history (URS 2003). Consequently, it does not appear eligible for listing in the NRHP/CRHR under Criterion A/1 (Events). As this feature has no known connection with individuals important in local, state or national history, it does not appear eligible under NRHP/CRHR Criterion B/2 (Persons). This feature also does not exhibit important design characteristics for its type or evidence of having been the work of a master. Consequently, it does not appear eligible for listing in the NRHP/CRHR under Criterion C/3 (Architecture/Construction). Field observations and documentary research conducted by URS indicate there is little or no chance that subsurface artifacts or related features are present. In the absence of such materials, this feature does not possess the data potential that would render it eligible for NRHP/CRHR listing under Criterion D/4 (Information Potential).

Historic Era Adits (P-01-010674) does not appear eligible for listing in the NRHP or CRHR.

Historic Era Corral Site (P-43-001606)

Description

This cattle corral, still in use at the time of the 2003 URS documentation (URS 2003), has been heavily modified since its original period of construction (possibly in the early 20th century). Most of the structural components consist of modern materials such as welded steel gates, chain-link fencing, a loading chute, etc. However, some portions of the corral include older elements, including split rail posts, full-dimension lumber with cut nails, and heavily aged barbed wire.

Evaluation

Documentary research, field reconnaissance, outreach to Native American groups, and public outreach have not uncovered any information that would indicate that this feature is associated with any significant event in local, state, or national history. As such, it is not considered eligible to the NRHP/CRHR under Criterion A/1 (Events). As there is no documented connection of this corral to individuals important in local, state, or national history, it appears ineligible under NRHP/CRHR Criterion B/2 (Persons). Livestock corrals such as this example are commonly encountered in the region and throughout California. Significantly altered since its original construction, this corral does not retain integrity of materials or design. It does not exhibit important design characteristics for its type or evidence of having been the work of a master. Consequently, this structure appears ineligible for listing in the NRHP/CRHR under Criterion C/3 (Architecture/Construction). As the property consists of an extant corral, there appears to be little

or no chance that subsurface artifacts or related features are present. As a result, it does not appear to possess the data potential that could render it eligible for NRHP/CRHR listing under Criterion D/4 (Information Potential).

Historic Era Corral Site (P-43-001606) does not appear eligible for listing in the NRHP or CRHR.

Possible Prehistoric Chert Quarry Site (P-43-001600)

Description

This site was recorded as a possible prehistoric chert quarry with a small area of dark black, highly organic, “midden-like” soil. While ART personnel did not observe any conclusively culturally modified chert among its surface constituents, it retains certain qualities that make it likely that the outcrop was exploited by the area’s prehistoric population. The chert is of excellent quality. Outcrops such as this were often exploited for the material which was carried away for use elsewhere, leaving little or no culturally-modified material at the quarry site.

Evaluation

Research uncovered no evidence that this site is associated with any significant event in local, state, or national history. It does not appear eligible for listing in the NRHP/CRHR under Criterion A/1 (Events). There is no known connection of this site to individuals important in local, state or national history, and as a result it does not appear eligible for listing in the NRHP/CRHR under Criterion B/2 (Persons). As research at this site has not yet yielded any signs of human use, it does not possess any important design characteristics or evidence of it having been the work of a master; it does not appear eligible to the NRHP/CRHR under Criterion C/3 (Architecture/Construction). While no definitively cultural material was noted at this site, it is likely that additional fieldwork would provide evidence that Native Americans made use of this material source. At present, information about this site is insufficient to conclusively assess its significance. For the purposes of this document, the site is considered to possess the potential to contribute to an understanding of prehistoric quarrying in the Valley and is considered potentially eligible for listing in the NRHP/CRHR under Criterion D/4 (Information Potential).

Possible Prehistoric Chert Quarry Site (P-43-001600) appears eligible for listing in the NRHP or CRHR.

Historic Era Habitation Site (CD 8)

Description

This historic-era site is located on the south side of Calaveras Reservoir and is likely related to late 19th- to early 20th- century settlement of, and domestic and agricultural activities in, Calaveras

Valley before construction of the dam. It consists of several features including a rock-lined well, two small mortared stone foundation pads, a stone retaining wall, and a possible stone foundation. An associated artifact scatter includes fragments of bottle glass (clear, blue, and amethyst), ceramic fragments (white improved earthenware and porcelain), various metal fragments, and several clam shells.

Evaluation

Archival and field research did not uncover evidence to identify the individual who created and occupied the site. Additional research may allow the site's historical associations to be determined. At this time is unclear whether or not this site is associated with any significant event in local, state, or national history as required for listing in the NRHP/CRHR under Criterion A/1 (Events). Similarly, although there is no known connection of this site to individuals important in local, state, or national history, this can only be determined through additional research. At this time it is unclear as to whether the site is eligible under NRHP/CRHR Criterion B/2 (Persons). None of the features exhibit important design characteristics for their type or evidence of having been the work of a master. Consequently, this site does not appear to be eligible for listing in the NRHP/CRHR under Criterion C/3 (Architecture/Construction). However, this site appears eligible for listing in the NRHP/CRHR under Criterion D/4 due to its potential to contain significant historical information on the late 19th- to early 20th- century settlement of, and domestic and agricultural activities in, Calaveras Valley preceding construction of the dam.

Historic Era Habitation Site (CD 8) appears to be eligible for listing in the NRHP or CRHR.

Historic Era Habitation Site (CD 10)

Description

This historic-era site is situated on an alluvial fan between east-facing hills and the valley/reservoir and is likely related to 19th- and early 20th-century settlement and domestic and agricultural activities in Calaveras Valley preceding the construction of the dam. It consists of a sandstone foundation and brick scatter, a rock-lined spring box, and an associated depression. This site is identified on an 1866 GLO map as the location of "Randy Brown's House."

Evaluation

To date insufficient research has been conducted to determine whether this site is associated with historically important events or individuals; its eligibility to NRHP/CRHR under Criteria A/1 (Events) and B/2 (Persons) is unclear at this time. The site contains no standing remains. Even if the site once bore important and distinct design characteristics or was the work of a master, in its

current condition the site appears to lack sufficient integrity of design, materials, and workmanship to enable it to convey its significance under NRHP/CRHR Criterion C/3 (Architecture/Construction). However, this site may contain important information about historic-era settlement and domestic and agricultural activities in Calaveras Valley preceding construction of the dam. Because this site may contain important data, it appears eligible for NRHP and CRHR under Criterion D/4.

Historic Era Habitation Site (CD 10) appears eligible for listing in the NRHP or CRHR.

Calaveras Dam Construction Workers' Site (CD 20)

Description

This historic-era site is depicted on several GLO maps and is within the historic extent of the Calaveras Reservoir. It contains portions of a local sandstone cobble building foundation and one artifact concentration containing glass bottle fragments (amethyst, brown, and olive green) that have been burned and melted. An artifact concentration extends over the entirety of the site, 390 feet north/south by 330 feet east/west. The materials include habitation debris (ceramic, glass, and metal fragments) and artifacts relating to livestock and ranching activities (horseshoes, bits, and machinery leaf springs). Photographs taken in 1916 depict a large Calaveras Dam work camp in the vicinity of this site. The photos also show a substantial settlement at this location consisting of tents neatly arranged around a central building that was, perhaps, the mess hall.

This site is associated with the construction of the Calaveras Dam and likely represents the remains of the 1916-era work camp.

Evaluation

The site is directly associated with the construction of Calaveras Dam. The historic significance of this event and of persons associated with this structure is evaluated below under the discussion of the Calaveras Dam Complex as an historic architectural resource. That analysis concludes that the Calaveras Dam Complex is not significant under NRHP/CRHR Criterion A/1 (Events) or Criterion B/2 (Persons). Documentary research, field reconnaissance, and public outreach have failed to uncover any information that would otherwise indicate that this site is associated with any significant event or person in local, state, or national history. As such, it does not appear eligible for listing in the NRHP/CRHR under Criterion A/1 (Events) or Criterion B/2 (Persons). It is unclear at this time whether the site retains integrity of design and materials to enable it to convey its significance; consequently, its eligibility under NRHP/CRHR Criterion C/3 (Architecture/Construction) is unclear.

As an archaeological site, this property is appropriately evaluated under NRHP/CRHR Criterion D/4 (Information Potential). Study of the artifacts and building remains may yield important information that is not otherwise available in the documentary record such as the ethnicity, organization, health, diet, leisure activities, and working conditions of the dam workers. As a result, this site appears to be eligible to NRHP/CRHR Criterion D/4 due to its potential to contain important information.

Calaveras Dam Construction Workers' Site (CD 20) appears eligible for listing in the NRHP or CRHR.

Prehistoric Bedrock Mortar / Lithic Scatter Site (CD 26)

Description

The site is located on the southeast edge of Calaveras Valley on a low finger ridge. Although now upland from the current shoreline of the reservoir, the entire site is within the historic extent of the reservoir.

Artifacts on the surface of this site consist of one bedrock mortar, two manos, one pestle, a bowl mortar fragment, and one chert flake and several possibly worked pieces of chert. The site has been subject to heavy erosion. The slopes around the ridge have been eroded to exposed bedrock. Remaining on the ridge-top are sandstone bedrock outcrops and shallow clay loam soil. The site does not appear to contain subsurface deposits.

Evaluation

Documentary research, field reconnaissance, outreach to Native American groups, and public outreach did not uncover any evidence that this site is associated with any significant event or person in local, state, or national history; it does not appear to be eligible to NRHP/CRHR under Criterion A/1 (Events), Criterion B/2 (Persons), or Criterion C/3 (Architecture/Construction). This site is appropriately evaluated under Criterion D/4 for its potential to yield important information about the prehistoric occupation of Calaveras Valley. Based on field observations, this site appears to possess very shallow soils and has been heavily eroded by reservoir fluctuation. There is no evidence that additional remains are present below the ground's surface. The site does not possess sufficient integrity of design, materials, or association that would allow the data it contains to address important research questions such as chronology of settlement, development of subsistence practices over time, social organization, migration, and trade. As the site does not contain important information, it does not appear eligible to NRHP/CRHR under Criterion D/4.

Prehistoric Bedrock Mortar / Lithic Scatter Site (CD 26) does not appear eligible for listing in the NRHP or CRHR.

Historic Era Debris Scatter Site (CD 27)

Description

This is a historic-era archaeological site consisting of tree stumps, a concentration of brick and stone, several metal artifacts, and a possible tractor. No foundations or other features appear to be present. The metal artifacts include a pipe and unidentifiable machinery parts. Also present are one white earthenware fragment, one clear bottle glass fragment, and one brown bottle glass fragment. Historical research has not determined the individual or social unit responsible for creating this site.

Evaluation

Documentary research, field reconnaissance, and public outreach have failed to uncover any information that would indicate that this site is associated with any significant event or person in local, state, or national history. It does not appear eligible for listing in the NRHP/CRHR under Criterion A/1 (Events) or Criterion B/2 (Persons). The site does not contain the types of resources generally evaluated by applying Criterion C/3 (Architecture/Design); thus it does not appear to be eligible to NRHP/CRHR under this criterion. This site is appropriately evaluated under Criterion D/4 (Information Potential) for its potential to yield important information about the historic era settlement and agricultural practices of Calaveras Valley prior to construction of the dam. As historical research was unable to determine the individual or social unit responsible for creating this site it lacks integrity of association, which severely limits its research potential. The site does not appear to possess sufficient integrity of design (such as discernible spatial organization of functions, patterns of deposition, and relationships between artifacts and features) to address research questions about the agricultural and domestic activities. This site does not appear to be eligible to NRHP/CRHR under Criterion D/4.

Historic Era Debris Scatter Site (CD 27) does not appear to be eligible for listing in the NRHP or CRHR.

Historic Architectural Resources

There are three historic architectural, or built environment resources located in the current Study Area: Calaveras Dam Complex CD 15; Calaveras Dam Keeper's Property CD 21; and Alameda Creek Diversion Dam and Tunnel CD 17. Calaveras Test Site CD 12 is not within the current Study Area (which, since the time of the cultural resources survey, has been more specifically defined). However, the Calaveras Test Site is immediately adjacent to the current Study Area,

and is discussed in this section for informational purposes. The three sites are described below, followed by an evaluation under NRHP and CRHR criteria.

Calaveras Dam Complex (CD 15)

Description

The Calaveras Dam Complex was constructed between 1913 and 1925 and has been modified and added to over time. The standing buildings and structures that comprise the dam complex include the earthfill dam, concrete-lined spillway, spillway concrete bridge, Spanish Revival style outlet tower and vista point, and the Calaveras Creek pipeline/tunnel. There are also minor built environment features associated with the dam and reservoir, including two separate segments of a rock wall located at the west end of the dam immediately adjacent to the outlet tower, a rock wall located on the north face of the dam, and a rock staircase/walkway that is located on the west-facing slope (east of the lower spillway) that was related to the demolished aerator building.

The Calaveras Dam complex also includes other buildings, structures, and features, including dirt and paved access roads as well as contemporary buildings and structures. There are at least five riveted pipe culverts located along the access road leading to the dam. There are also contemporary buildings, such as the building adjacent to the vista point, and contemporary buildings adjacent to the stairs east of the lower spillway, including the potassium permanganate building, as well as several above-grade concrete structures that provide access points to the Calaveras Creek pipeline.

The WSIP PEIR identified a potential historic district that included Calaveras Dam and its structures. The WSIP PEIR left the determination of whether the resource is appropriately characterized as an historic district to project-level CEQA evaluation. A historic district consists of a related grouping of properties possessing a “concentration, linkage or continuity of sites, buildings, structures, or objects, united historically or aesthetically by plan or physical development” (NPS 2005). The structures and features comprising the Calaveras Dam Complex are characterized by a unity of function. The complex was constructed and continues to function as a functionally integrated facility under singular ownership and control, comprised of the dam and ancillary features that support the functioning of the dam. As such, the Calaveras Dam Complex is more appropriately characterized and evaluated as an individual resource.

Evaluation

Under NRHP/CRHR Criterion A/1 (Events), dams are potentially significant if they are importantly associated with trends and/or events in water systems development or can be shown to be important within the context of local or regional economic and community development. Dams, like other water-related structures or infrastructure, are inherently vital to the communities

they serve. However, to be eligible for listing in the NRHP/CRHR under Criterion A/1, resources such as dams and their associated structures must have demonstrable importance directly related to significant historic events and trends, with emphasis given to specific demand for such facilities and the social, economic, commercial, and/or industrial effects their construction had locally, regionally, or nationally. While the construction of the Calaveras Dam and Reservoir increased the water supply for the SVWC and the City of San Francisco, by the time construction was completed in 1925 other water conveyances were in operation meeting the needs of the San Francisco Bay Area. EBMUD's Mokelumne River system, for example, began delivering water by 1923. In other parts of the Bay Area, similar municipal systems such as the Marin Water District and Santa Clara Valley Water District were also formed during this period to provide water for portions of the region. If the dam had been completed on time, it may have made a significant contribution to the City's water system and the region's early 20th century development, but it failed in 1918 and did not begin to deliver its full yield until 1925 after several other water sources had been developed. The Calaveras water delivered to the Bay Area had limited direct impact, and Calaveras Reservoir's supply could not prevent the City's need to obtain water from other water districts such as the EBMUD during the drought in the late 1920s. Furthermore, the Great Depression of the early 1930s slowed economic development in the region and demand for water. The dam complex, therefore, is not important for its association with any events in local, state, or national history, including the community and economic development of the San Francisco Bay Area, and is not significant under Criterion A/1. The dam complex also does not appear to be significant under NRHP/CRHR Criterion B/2 (Persons) for its association with persons important in local, state, or national history. Although prominent engineers, such as M.M. O'Shaughnessey, William Mulholland, and Fred C. Herrmann, were associated with the Calaveras Dam Complex, this structure does not represent an important example of their work. There is no indication that such persons obtained sufficient prominence to qualify this lesser work for listing in the NRHP/CRHR under Criterion B/2 for its association with important persons.

Under NRHP/CRHR Criterion C/3 (Architecture/Construction), dams may be significant for their importance within the field of dam engineering and design. This significance derives from a dam embodying distinctive characteristics of type, period, or method of construction or representing the work of a master engineer, designer, or builder. Attributes to consider are its rarity, innovative design techniques or use of construction methods, boldness of the engineering achievement, and aesthetics. These attributes are weighed in conjunction with evaluation of a dam's type, period, or method of construction and its association with possible historically significant engineers and/or builders. The 1913-1918 Calaveras Dam was built using a hydraulic fill method and collapsed in 1918; and the 1925 rebuilt dam employed a packed earth-fill method. Neither of these engineering designs was unusual or innovative when they were utilized. Additionally, the original (1913) dam failed in 1918 when its sides collapsed under the weight of the clay slurry. As noted above, many other similarly size earth-filled dams were constructed during the early 20th century and nothing in the accounts of Calaveras Dam's construction

suggests that it was designed and built through anything other than a standard process, well understood at the time. Furthermore, while a number of prominent engineers, such as M.M. O'Shaughnessey, William Mulholland, and Fred C. Herrmann, were associated with the Calaveras Dam Complex, this structure does not represent an important example of their work and none of these men gained their prominence through their work on the dam. SVWC engineers George A. Elliot, T.W. Espy, and I.S. Flaa spent most of their careers at the company and although they were competent and reliable in their positions, the historic record does not indicate that any of these men could be considered a master engineer. In rare instances, buildings and structures themselves can serve as sources of important information about historic construction materials or technologies (Criterion D/4, Information Potential); however, the dam complex buildings and structures do not appear to be a principal source of important information in this regard.

In addition to the dam complex's lack of historic significance, it also lacks historic integrity. The City incrementally altered the dam complex in the 1930s, and the 1975 seismic retrofit and 1990s demolition of 1930s-era structures both diminished the complex's integrity of setting, design, materials, workmanship, feeling, and association. The dam and its associated features do not retain the physical characteristics from any possible period of significance related to its original construction or from the initial period in which the City of San Francisco took control of the dam/reservoir complex. In particular, the alterations in 1975 not only changed the size of the dam, but also removed the arches on the downstream face, thus altering its original appearance and an important aesthetic enhancement that had been built with the dam. While the outlet tower and vista point are architecturally interesting, are representative of Spanish Revival style, and retain a degree of historic integrity, they alone do not have sufficient significance to be individually eligible and they lack sufficient historic integrity of setting in which they would be able to convey their significance. These features are part of the larger complex and cannot be understood except in the context of the dam and its other associated features.

For these reasons, the Calaveras Dam Complex (CD 15) is not considered eligible for listing in the NRHP or CRHR.

Calaveras Dam Keeper's Property (CD 21)

Description

The Calaveras Dam Keeper's Property is situated on the east shore of Calaveras Reservoir south of Calaveras Dam. The Dam Keeper's Property at Calaveras Reservoir consists of ten buildings and/or structures: a water tower, barn, shed, animal enclosure, poultry enclosure, loading platform, two garages, and two houses. It also includes a small pond near the east end, a contemporary propane tank, a small orchard, and two corrals.

Evaluation

The construction of a watershed / dam keeper's residence at Calaveras Reservoir was of secondary importance to the construction and maintenance of Calaveras Dam. The property serves a support function to the City's delivery of water from Calaveras Reservoir. In this way, the Dam Keeper's Property is similar to other components of the City's water system infrastructure. A city's water system infrastructure is inherently vital to the communities it serves; however, to be eligible for listing in the NRHP/CRHR under Criterion A/1 (Events), infrastructure resources must have demonstrable importance directly related to significant historic events and trends, with emphasis given to specific demand for such facilities and the social, economic, commercial, and/or industrial effects their construction had locally, regionally, or nationally. While the construction of the Calaveras Dam and Reservoir increased the water supply for the SVWC and the City, by the time the full water supply became available in 1925 other water conveyances were in operation to meet the needs of the San Francisco Bay Area, and the Calaveras water delivered to the Bay Area had limited direct economic or community development impact. The Dam Keeper's Property, therefore, is not important for its association with any events in local, state, or national history, including the community and economic development of the San Francisco Bay Area, and is not significant under NRHP/CRHR Criterion A/1. The Dam Keeper's Property also does not appear to be significant under NRHP/CRHR Criterion B/2 (Persons) for its association with persons important in local, state, or national history. There is no indication that the property is associated with any person important at the local, state or national level. Although prominent engineers were associated with the design and construction of the Calaveras Dam Complex as discussed above, none are associated with the design and construction of the Dam Keeper's Property.

Under NRHP/CRHR Criterion C/3 (Architecture/Construction), the buildings and structures at the Dam Keeper's Property do not embody distinctive characteristics of type, period, or method of construction and they do not represent the work of a master architect or builder. The property includes modest examples of Ranch style residential architecture that were built well into the period in which this style was popular and widely constructed in California. The other buildings and structures are utilitarian examples of service buildings and structures and do not demonstrate particular ingenuity or significant design. In addition, the buildings and structures are not known to have been designed or built by a master, nor do they appear to be designed or built by masterful architects or builders. While a number of prominent engineers, such as M.M. O'Shaughnessey, William Mulholland, and Fred C. Herrmann, were associated with the Calaveras Dam Complex, none are associated with the dam keeper's residence. In addition, in rare instances buildings themselves can serve as sources of important information about historic construction materials or technologies and be significant under NRHP/CRHR Criterion D/4 (Information Potential); however, these buildings do not appear to be a principal source of important information in this regard.

In addition to the Dam Keeper's Property's lack of historical significance, there are also issues related to the property's retention of historic integrity. The circa 1915 barn has been modified and there are no other buildings or structures on the property that date to the period when Calaveras Dam was initially built (1913-1925). Thus, the property does not retain historic integrity to the early 20th century period when Calaveras Dam was constructed. The buildings and structures that are on the property appear to have had some alterations over time, but generally retain many of their physical characteristics from when they were constructed and thus retain some degree of integrity. Even so, the property lacks historical significance.

For these reasons, the Calaveras Dam Keeper's Property (CD 21) is not considered eligible for listing in the NRHP or CRHR.

Alameda Creek Diversion Dam and Tunnel (CD 17)

Description

The Alameda Creek Diversion Dam and Tunnel are composed of the Alameda Creek Diversion Dam, a workman's shelter, tunnel outlet, and tunnel outlet bucket and channel. The Alameda Creek Diversion Dam (built in 1931) is an ogee dam (the dam and aprons are constructed to allow excess water to spill over the dam crest and down the creek bed) that sits generally north-south across the generally east-west Alameda Creek. The dam is flanked by a concrete structure that provides access to the interior of the dam and by the diversion intake. The diversion intake to the Alameda Tunnel is located on the south bank of Alameda Creek and is comprised of a three-tiered trash rack constructed of board-formed concrete and metal bars commonly known as "grizzly gates" or "trash gates" designed to keep large debris out of the tunnel. A walkway with metal railings is located along the top tier of the trash gates. Three square concrete posts attached to the bottom tier rise from the creek bed to the top tier that act as a log boom, designed to prevent large debris from damaging or clogging the trash rack. An inlet sluice tunnel is located on the bottom diversion tier at the creek bed on the south side of the dam and two outlet sluice tunnels are located on the north side of the diversion. These tunnels allow water to bypass the dam and continue downstream. Metal gates can be lowered to stop the flow.

The diversion intake leads to the Alameda Creek Diversion Tunnel, the inlet of which is constructed of board-formed concrete and features two approximately 5-foot-by-5-foot openings with metal supports. Metal gates can be lowered to cover the openings and filter debris. The tunnel is approximately 6 feet tall and 5 feet wide with a concrete aggregate floor and board-formed concrete walls and ceiling. At the south end of the tunnel the outlet is through a rectangular opening, orientated east-west, and features a decorative lintel with an arched opening along its top surface. Below the outlet is a concrete bucket outfall structure that leads to a concrete-lined channel to convey the water to Calaveras Reservoir.

Evaluation

Under NRHP/CRHR Criterion A/1 (Events), dams are potentially significant if they are importantly associated with trends and/or events in water systems development or can be shown to be important within the context of local or regional economic and community development. Dams, like other water-related structures or infrastructure, are inherently vital to the communities they serve. However, to be eligible for listing in the NRHP/CRHR under Criterion A/1, resources such as dams and their associated structures must have demonstrable importance directly related to significant historic events and trends, with emphasis given to specific demand for such facilities and the social, economic, commercial, and/or industrial effects their construction had locally, regionally, or nationally. The Alameda Creek Diversion Dam and Tunnel increased the productivity of the Calaveras Reservoir by up to 30 percent. This additional water was valuable, and increased the total supply available in Calaveras Reservoir. While the construction of the dam and tunnel increased the water supply for the City, its impact on the economy and community development of the San Francisco Bay Area was limited by the time this water supply became available in 1931. In part this is because in other parts of the Bay Area, municipal systems similar to San Francisco's were also formed during the same period to provide water for portions of the region. The City of San Francisco completed the Alameda Creek Diversion Dam and Tunnel just before the Hetch Hetchy system began operation (in 1934) and, thus water diverted from Upper Alameda Creek provided only a relatively small addition to the City's water system. Also water delivered to the Bay Area from Calaveras Reservoir had limited direct impact, as is evident because Calaveras Reservoir's supply could not prevent the City's need to obtain water from other water districts such as the EBMUD during the drought in the late 1920s. The dam and tunnel structure, therefore, is not important for its association with any events in local, state, or national history, including the community and economic development of the San Francisco Bay Area, and is not significant under Criterion A/1.

The dam and tunnel structure also does not appear to be significant under NRHP/CRHR Criterion B/2 (Persons) for its association with persons important in local, state, or national history. Although engineers such as C.A. Lowensten, T.W. Espy, and W.L. Eppler, and others associated with the design and construction of the diversion dam and tunnel may have been valuable experts and employees, there is no indication that such persons obtained sufficient prominence at the local, state, or national level to qualify this structure for listing in the NRHP/CRHR under Criterion B/2 for its association with important persons.

Under NRHP /CRHR Criterion C/3 (Architecture/Construction), dams may be significant for their importance within the field of dam engineering and design. This significance derives from a dam embodying distinctive characteristics of type, period, or method of construction or representing the work of a master engineer, designer, or builder. Attributes to consider are its rarity, innovative design techniques or use of construction methods, boldness of the engineering

achievement, and aesthetics. These attributes are weighed in conjunction with evaluation of a dam's type, period, or method of construction and its association with possible historically significant engineers and/or builders. The diversion dam is modestly sized ogee design, a relatively common method of construction. Other ogee dams had been built in Northern California before the Alameda Creek Diversion Dam, including the Sunol Dam in 1900 and the dam on North Fork Feather River, built in 1908. Historical evidence did not indicate that the tunnel itself was an engineering achievement, particularly in comparison with other City of San Francisco tunnels being constructed at the same time on the system built to deliver Hetch Hetchy water, including Foothill Tunnel and the Coast Range Tunnel. Finally, while engineers such as C.A. Lowenstein, T.W. Espy, and W.L. Eppler, and others associated with the design and construction of the diversion dam and tunnel may have been valuable experts and employees, none of these individuals achieved their prominence for their work on the dam and tunnel. Therefore, the diversion dam and tunnel structure is not significant under NRHP/CRHR Criterion C/3 as a significant engineering resource. In rare instances, buildings and structures themselves can serve as sources of important information about historic construction materials or technologies (NRHP/CRHR Criterion D/4 (Information Potential)); however, the dam and tunnel do not appear to be a principal source of important information in this regard.

For these reasons, the Alameda Creek Diversion Dam and Tunnel (CD 17) are not considered eligible for listing in the NRHP or CRHR.

Calaveras Test Site (CD 12)

Description

The Calaveras Test Site, constructed between 1948 and 1958, is located in the south end of Calaveras Reservoir. Portions of the Calaveras Test Site were previously inventoried under the number P-43-001602. Many of the buildings and structures originally located on this property were demolished and removed between 1987 and 1997, including Building 7 and associated outbuildings such as the underground fire protection water tank, a 1,500-gallon underground diesel storage tank, and the septic/effluent tank. Remaining on the property are a Quonset-hut-shaped building used for detonating explosives, two Ranch style office buildings, and an open equipment shelter.

Additionally, the following structures are located throughout the site: a deteriorated bridge, a concrete aggregate retaining wall, a water tank, the ruins of a building, and six poured concrete foundations (in varying stages of deterioration).

Evaluation

The Calaveras Test Site was used by three civilian organizations for the research, testing, and manufacture of ordnances for military use between 1948 and 1993. The use of this property by SRI and its successors at the site can be broadly associated with the national defense efforts during the Cold War era. Research about the site, however, indicates that there is no evidence that this site played an important role within this context. Research regarding this property did not indicate that major technological advances were discovered or developed at the site nor does the site have any other known associations with significant events in local, state, or national history; therefore, the site is not eligible under NRHP/CRHR Criterion A/1 (Events). The property is also not known to be associated with individuals from Stanford Research Institute, TransTechnology or Quantic Industries that were significant in local, state, or national history, and therefore is not significant under NRHP/CRHR Criterion B/2 (Persons). Under NRHP/CRHR Criterion C/3 (Architecture/Constructions) the extant buildings and structures on the site also do not exhibit design characteristics that are important for their type, period, or method of construction and there is no evidence that any of the features on this site are the important work of a master. The features located here include modest examples of Ranch style buildings and utilitarian structures. In rare instances, buildings and structures themselves can serve as sources of important information about historic construction materials or technologies (NRHP/CRHR Criterion D/4, Information Potential); however, the features on this property do not appear to be a principal source of important information in this regard. Furthermore, most of the original buildings and structures on the property lack historic integrity of design, materials, workmanship, feeling, and association.

For these reasons, the Calaveras Test Site (CD 12) is not considered eligible for listing in the NRHP or CRHR.

4.10.2 IMPACTS

4.10.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standard for impacts related to cultural resources, but generally considers that the project would have a significant impact on cultural resources if it were to:

- Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code;
- Cause a substantial adverse change in the significance of a unique archaeological resource pursuant to Section 15064.5;

- Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or
- Disturb any human remains including those interred outside formal cemeteries.

The CEQA Guidelines Section 15064.5 establishes the criteria for assessing the significance of impacts on historical resources under CEQA. It states, “[a] project with an effect that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment.” The CEQA Guidelines define “substantial adverse change” as a “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired” (Section 15064.5(b)(1)). The significance of an historic architectural resource is considered to be “materially impaired” when a project demolishes or materially alters the physical characteristics that justify the inclusion of the resource in the California Register, or that justify the inclusion of the resource in a local register, or that justify its eligibility for inclusion in the California Register as determined by the lead agency (Section 15064.5(b)(2)).

4.10.2.2 APPROACH TO ANALYSIS

The evaluation of impacts on historical resources under CEQA is a two-step process. The first step is to determine whether any potentially affected properties within the area are “historical resources” as defined in CEQA Guidelines Section 15064.5(a)(3). The second step is to evaluate whether the proposed project would cause a “substantial adverse change,” as defined in CEQA Guidelines Section 15064.5(b), to the historical resource (if a historical resource is present).

As described and cited above in the preceding Setting subsection, an Archaeological Survey Report and a Historic Resources Inventory and Evaluation Report were prepared by archaeological and historic architectural resource consultants meeting the Secretary of the Interior’s professional qualifications. These studies are summarized in that subsection and form the basis of the analysis and conclusions in this EIR section. Through review of previous archaeological studies and through field reconnaissance, the Archaeological Survey Report identified a total of 10 known potential archaeological resources within the CDRP Study Area (the area that could be affected by project construction and operation activities). The Historic Resources Inventory and Evaluation identified four potential historic architectural resources (including Calaveras Test Site which is not within the current Study Area, but is included for informational purposes). Each of these 14 known potential resources was evaluated by applying the eligibility criteria for the National Register of Historic Places and the California Register of Historical Resources. These evaluations yielded four archaeological sites within the Calaveras Dam Cultural Resources Study Area that are eligible for inclusion in the NRHP/CRHR, and are therefore considered historical resources for the purposes of CEQA. No historic architectural resources within the Study Area were found to meet NRHP/CRHR criteria.

Evaluated below (Impact 4.10.1) is the impact of ground-disturbing activities on these known archaeological resources that are considered historical resources under CEQA. In addition, as the historic context presented in the Setting subsection indicates a high probability of accidentally encountering unknown archaeological resources during construction, the impact of ground-disturbing activities on unknown archaeological resources is evaluated below (Impact 4.10.2). Known NRHP/CRHR-eligible archaeological sites may also be affected by inundation when water levels are restored during project operations (Impact 4.10.3). Impacts on historic architectural resources are also briefly evaluated below (these are not considered historical resources under CEQA) (Impact 4.10.4). Also evaluated below is the potential impact of construction activities on unknown paleontological resources, given a high probability of accidentally encountering such resources during ground-disturbing construction activities (Impact 4.10.5).

The Water System Improvement Program (WSIP) PEIR identified a potentially significant unavoidable (PSU) impact of the Calaveras Dam Replacement Project on a potential historic district “if one exists” (CCSF 2008, p. 4.7-72). As discussed above, the Calaveras Dam Complex is more appropriately described and evaluated as an individual resource, rather than as a historic district. Therefore, the impact on a potential historic district is not identified and discussed below as an impact of the Calaveras Dam Project.

The WSIP PEIR identified a potentially significant mitigable (PSM) impact of the Calaveras Dam Replacement Project on “adjacent historic architectural resources” (CCSF 2008, p. 4.7-84). Further project-level study in this EIR has concluded that the adjacent Calaveras Dam Keeper’s Property (CD 21) and Calaveras Test Site (CD 12) are not considered historical resources under CEQA. Therefore, the proposed project would not have a significant impact on adjacent historical resources, and the impact on adjacent historic architectural resources is not identified and discussed below as an impact of the Calaveras Dam Replacement Project.

4.10.2.3 PROJECT IMPACTS

Table 4.10.1 summarizes the project-related impacts on cultural resources described in this section.

As presented in the preceding Setting subsection, the Archaeological Survey Report (ETJV 2008) identifies four known archaeological resources within the CDRP Study Area that appear to meet the criteria for inclusion in the NRHP and CRHR: Possible Prehistoric Chert Quarry Site (P-43-001600); Historic-Era Habitation Site (CD 8); Historic-Era Habitation Site (CD 10); and the Calaveras Dam Construction Workers’ Site (CD 20). As such, they are considered historical resources for the purposes of CEQA. As summarized in the preceding Setting subsection, the Historic Resources Inventory and Evaluation Report (JRP 2008) concludes that none of the

architectural resources in the Study Area meet the criteria for inclusion in the NRHP or the CRHR. As such, they are not considered historical resources for the purposes of CEQA.

Table 4.10.1: Summary of Cultural Resources Impacts

Impact	Level of Significance
4.10.1: Impact of construction activities on known archaeological resources.	LSM
4.10.2: Impact of construction activities on unknown archaeological resources.	LSM
4.10.3: Impact of restoration of reservoir water levels and project operations on known archaeological resources.	LSM
4.10.4: Construction impacts on historic architectural resources.	NI
4.10.5: Construction impacts on unknown paleontological resources.	LSM
4.10.6: Impact of restoration of reservoir water levels and project operations on unknown paleontological resources.	LS
<i>Notes:</i> NI – No impact LS – Less than significant LSM – Less than significant with mitigation	

Construction activities would result in extensive ground disturbance within the Study Area, including, but not limited to, the following:

- The east and west abutments flanking the proposed replacement dam would be excavated and stabilized.
- The eastern face of Observation Hill, including its peak, would be removed to excavate the spillway and would serve as a source of construction materials (about 1.87 million cubic yards). The excavated area would be graded into a series of benches.
- Borrow Area B, just north of Hill 1000 (site of the old quarry used to obtain materials for the existing dam), would be excavated as a source of construction materials. About 8 acres would be excavated to a depth of 200 to 280 feet.
- Borrow Area E, at the south end of the reservoir, would be excavated as a source of construction materials. About 85 acres would be excavated to a depth of 10 to 20 feet.
- Eleven staging areas, totaling about 35.9 acres, would be cleared and graded.
- Construction of new temporary haul roads and widening of existing roads to serve the construction areas, borrow areas and staging areas.

Impact 4.10.1: Impact of construction activities on known archaeological resources.

Historic-Era Habitation Site (CD 8) and Dam Construction Workers' Site (CD 20) have the potential to be affected by direct construction impacts. The artifact concentration identified at CD 8 extends within the boundaries of Borrow Area E/Disposal Area 5 and Disposal Site 5. The construction and use of the West Haul Road has the potential to affect CD 20.

Impact Conclusion

Construction of the project could have a significant adverse impact on significant known archaeological resources.

Mitigation Measure 5.10.1, Archaeological Evaluation and Monitoring, and Treatment of Human Remains, presented in Chapter 5, would be implemented when known significant archaeological resources within the Study Area are subject to ground-disturbing construction activities. The measure includes pre-construction archaeological screening; formal evaluation; avoidance of resources through project redesign or exclusion measures (if necessary and feasible); monitoring; and a data recovery program (if required) as specified in an approved archaeological evaluation plan and archaeological research design and treatment plan.

Implementation of this mitigation measure would identify and preserve the information potential of these sites, and thereby reduce potential impacts of construction on known archaeological resources to a less-than-significant level.

Impact 4.10.2: Impact of construction activities on unknown archaeological resources.

The CDRP Cultural Resources Study Area is within an archaeologically sensitive region, where there exists a substantial probability of accidentally encountering significant unknown archaeological resources during ground-disturbing construction activities within the Study Area, including the accidental discovery of Native American human remains as documented during the construction of the existing dam.

Accidental disruption of unknown archaeological resources in the Cultural Resources Study Area could impair the potential of these sites to yield information important to prehistory and history.

Impact Conclusion

Construction of the project could have a significant adverse impact on significant unknown archaeological resources.

Mitigation Measure 5.10.2, Accidental Discovery Measures, establishes procedures to be implemented in the event of accidental discovery of unknown archaeological resources during construction. The measure includes immediate suspension of work in the event of encountering a suspected archaeological resource; distribution of an “Alert Sheet” to inform contractors; retention of an archaeological consultant to evaluate the resource and recommend what action (if any) is warranted; preservation of the resource *in situ*; archaeological monitoring; archaeological testing and data recovery, and preparation of a report presenting, analyzing and interpreting the recovered data. This measure is applicable in all areas of the Study Area, throughout all phases of construction. Implementation of this mitigation measure would identify and preserve the

information potential of unknown archaeological resources accidentally discovered during construction, and thereby reduce potential impacts of construction on unknown archaeological resources to a less-than-significant level.

Impact 4.10.3: Impact of restoration of reservoir water levels and project operations on archaeological resources.

Areas of Possible Prehistoric Chert Quarry Site (P-43-001600), Historic-Era Habitation Site (CD 8), Historic-Era Habitation Site (CD 10), and the Calaveras Dam Construction Workers' Site (CD 20) are within the reservoir inundation zone, below the normal maximum water surface elevation of 756 feet for the new dam. All three of these sites were previously under water and have been previously affected by inundation, shoreline wave action, and wet/dry cycles during more than 70 years of dam operation. They were exposed when the reservoir was drawn down in 2001, and will generally remain exposed until the new dam is constructed and the water level of the reservoir is brought back to normal operational levels.

Such archaeological sites, if not already disturbed by historic reservoir operations and proposed project construction activities as described above under Impact 4.10.1, would be inundated, or would be within the fluctuation range of water levels, during filling of the reservoir and with operation of the proposed project at restored water levels. Inundation and fluctuation of water levels could cause deterioration and erosion of surface archaeological resources, displacement of artifacts, and deposition of sediment. Such impacts could impair the potential of these features to yield information important to prehistory and history and thus affect the qualities that make them eligible to NRHP and CRHR.

In addition to the potential effects on the known archaeological resources identified above, refilling and future operations of the reservoir could affect unknown archaeological resources. Restoring the reservoir water elevation and future operations of the reservoir could subject some areas of the reservoir shoreline that have been above the reservoir surface elevation during the CEQA baseline period to shoreline erosion. Buried archaeological resources could be exposed by shoreline erosion, and exposed resources could subsequently be damaged by erosion or weathering.

Under both existing conditions and proposed future operations, the reservoir shoreline would be subject to erosion in some locations. Refilling the reservoir under the proposed project would increase the size of the reservoir; thus the shoreline location and the resulting area that would be affected by erosion would change as a result of the project. However, this change in shoreline location would not substantially alter the nature or severity of shoreline erosion due to reservoir level fluctuations or wave action, or the probability that shoreline erosion could expose and cause a substantial adverse change in the significance of an unknown archaeological resource, if any exists. Therefore, compared to existing conditions, the potential impacts of restoring the reservoir

water level and future operations of the reservoir on unknown archaeological resources would be less than significant.

Impact Conclusion

Operation of the project could have a significant adverse impact on significant known archaeological surface features. Mitigation Measure 5.10.1, Archaeological Evaluation and Monitoring, and Treatment of Human Remains, presented in Chapter 5, would be implemented for these resources. The measure includes pre-construction archaeological screening, formal evaluation, and a data recovery program (if required) as specified in an approved archaeological evaluation plan and archaeological research design and treatment plan.

Implementation of this mitigation measure would identify and preserve the information potential of known archaeological surface features that may be affected by restoration of reservoir water levels and would thereby reduce potential operations impacts on these resources to a less-than-significant level. Effects of operation of the project on unknown archaeological resources would be less than significant.

Impact 4.10.4: Construction impacts on historic architectural resources.

As summarized in the preceding Setting subsection, the Historic Resources Inventory and Evaluation Report (JRP 2008) concludes that none of the buildings or structures in the Study Area meet the criteria for inclusion in the NRHP or the CRHR. As such, they are not considered historical resources for the purposes of CEQA.

Therefore, demolition or alteration of buildings and structures, as proposed under the Calaveras Dam Replacement Project, would have no impact on historic architectural resources that are considered historical resources under CEQA.

Impact 4.10.5: Construction impacts on unknown paleontological resources.

The Study Area is within a geologic locality where there is a high probability of encountering unknown paleontological resources during ground-disturbing construction activities such as excavation for the spillway, excavation of borrow areas, and construction of haul roads. Disruption of paleontological resources during project construction could impair the potential of such resources to yield important scientific information by destroying the resource and its association with other resources, or its stratigraphic association that could establish the age of the resource.

Impact Conclusion

Construction of the project could have a significant adverse impact on significant unknown paleontological resources.

Mitigation Measure 5.10.5 establishes procedures to address potential impacts on unknown paleontological resources during ground-disturbing construction activities. These mitigation measures require paleontological resources training for construction forepersons and field supervisors, identification of sensitive paleontological areas and detailed surveys of such areas, as well as monitoring and potential recovery treatment of unknown paleontological discoveries, as appropriate. These measures would be applicable to portions of the Study Area, where ground-disturbing construction activities would occur.

Implementation of this mitigation measure would identify and preserve the scientific information potential of paleontological resources, and thereby reduce potential impacts of construction on unknown paleontological resources to a less-than-significant level.

Impact 4.10.6: Impact of restoration of reservoir water levels and project operations on unknown paleontological resources.

There are no known paleontological resources in the project area. However, as stated in the Setting section above, the project is located in an area where there is a high probability of paleontological resources to occur. Reservoir shoreline areas are subject to erosion from wave action and water level fluctuations. As such, restoring the reservoir water elevation and future operations of the reservoir could subject some areas of the reservoir shoreline that have been above the reservoir surface elevation during the CEQA baseline period to erosion. Buried paleontological resources could be exposed by shoreline erosion, and exposed resources could subsequently be damaged by erosion or weathering. The direct or indirect destruction of a unique paleontological resource or site as a result of erosion of the reservoir shoreline would be considered a significant impact.

Under both existing conditions and proposed future operations, the reservoir shoreline would be subject to erosion in some locations. Refilling the reservoir under the proposed project would increase the size of the reservoir; thus the shoreline location and the resulting area that would be affected by erosion would change as a result of the project. However, this change in shoreline location would not substantially alter the nature or severity of shoreline erosion due to reservoir level fluctuations or wave action or the probability that shoreline erosion could expose and destroy a unique paleontological resource or site if any exists. Therefore, compared to existing conditions, the potential impacts of restoring the reservoir water level and future operations of the reservoir on paleontological resources would be less than significant.

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4.11 VISUAL RESOURCES

Section 4.11 Contents	
4.11.1 Setting	4.11.2 Impacts
4.11.1.1 Local Setting	4.11.2.1 Significance Criteria
4.11.1.2 Calaveras Reservoir and Valley	4.11.2.2 Approach to Analysis
4.11.1.3 Regulatory Framework	4.11.2.3 Project Impacts

This section describes the existing visual character and scenic quality of the Calaveras Dam and Reservoir setting, and evaluates the potential impacts of the proposed project on the visual quality of the project site and environs as viewed from areas accessible to the public.

4.11.1 SETTING

4.11.1.1 LOCAL SETTING

The project site lies in the Alameda Creek watershed at the juncture of the eastern San Francisco Bay Area, and at the western portion of the Diablo Range. This geologically active area is characterized by a varied topography. The watershed's hills, peaks, valleys, and rock outcrops are distinctive and recognizable visual features contributing to a strong sense of place in the area. Ridgelines are "echoed" by successive ridgelines rising beyond, contributing to a sense of visual pattern and harmony.

Land cover is a mix of oak woodland, oak savannah, riparian woodland, grassland, and chaparral, predominant throughout the California coastal range. A general but coherent pattern of denser oak woodlands covering north- and east-facing slopes and the sides of ravines, grasslands with scattered oaks covering south- and west-facing slopes, and denser riparian vegetation along creeks and ephemeral seasonal streams, is discernible. The edges of oak woodlands and riparian vegetation are organizing linear elements in the landscape that enhance the readability of the topography and provide visual variety and contrast between wooded areas and open grassland. During the winter and spring months, the hillsides are green and include displays of seasonal wildflowers. In the dry months of summer and fall, the grasslands are golden, increasing the visual contrast between the grasses and the dark green foliage of the oaks.

The overall visual character of the watershed is not characterized by natural impoundments of water, although constructed features, such as livestock ponds and reservoirs (like Calaveras Reservoir), contribute to visual quality.

The Alameda Creek watershed is ringed by urban development to the north, west, and southwest, but the local area generally retains an undeveloped rural character. Scattered rural residences, quarrying operations, and electrical and water facilities punctuate the landscape, but generally do not dominate the visual environment of the watershed nor define its visual character.

4.11.1.2 CALAVERAS RESERVOIR AND VALLEY

Subsection 4.11.1.2 Contents

Views of the Project Site from County Roads

Views of the Project Site from Sunol Wilderness

Calaveras Reservoir is located entirely within the SFPUC Alameda Watershed. Public access to the interior portions of the SFPUC Alameda Watershed lands is prohibited. Public views of the reservoir and valley are therefore available only from county roads in the area (most notably from Calaveras Road, to the west of the reservoir, and Felter Road to the south of the Reservoir) and from hiking trails within parkland bordering the SFPUC Alameda Watershed lands (most notably from Sunol Wilderness Regional Preserve [Sunol Wilderness] to the north of the reservoir).

Calaveras Reservoir, like most large bodies of water, is a highly memorable visual element in its setting. Where visible from public rights-of-way, views of the reservoir are high in visual quality. The flat expanse of the reservoir surface opens vistas across it and provides a counterpoint to the varied surrounding topography. The reservoir unifies the varied landforms that surround it, providing linear continuity along the reservoir's edge. Reflectivity, color, and movement are properties of water that contribute to visual interest and variety to the visual setting. A barren margin of land rings the entire reservoir at and above its water line, caused by fluctuations of water levels. This water line ring is a characteristic feature of reservoirs. As Calaveras Reservoir had been held at a reduced level since 2001, the growth of vegetation at the exposed perimeter of the reservoir has diminished some of the visual contrast with surrounding land.

Views of the Project Site from County Roads

Calaveras Road is a county road used by commuters and visitors to the parks in the area. It is also a popular route for cyclists. Calaveras Road is recognized by both Alameda and Santa Clara Counties for its scenic values. The northern portion in Alameda County is designated as an Alameda County Scenic Route under the *Alameda County General Plan* (Alameda County 1994, pp. 6-7). The southern portion in Santa Clara County is included in the “-sr Scenic Roads combining district” under the Santa Clara County Zoning Code (Santa Clara County, no date).

Calaveras Road in Alameda County runs through the Sunol Valley from Interstate 680 (I-680) southward toward the reservoir, along the east side of the valley floor. Here, the valley floor is broad, open, and flat but is enclosed by hills and ridges that line the valley. Several active quarrying facilities in the Sunol Valley are not prominent, if visible at all, from Calaveras Road or

from I-680 since these mining activities occur largely at or below grade. Their visibility is obscured by topography, screened by roadside vegetation, or lessened by distance. More prominent are the tree nurseries along Calaveras Road. Traveling southward, the valley narrows. Calaveras Road crosses to the west side of the valley floor at Geary Road and rises above the valley floor, winding along the contour through grassland and chaparral.

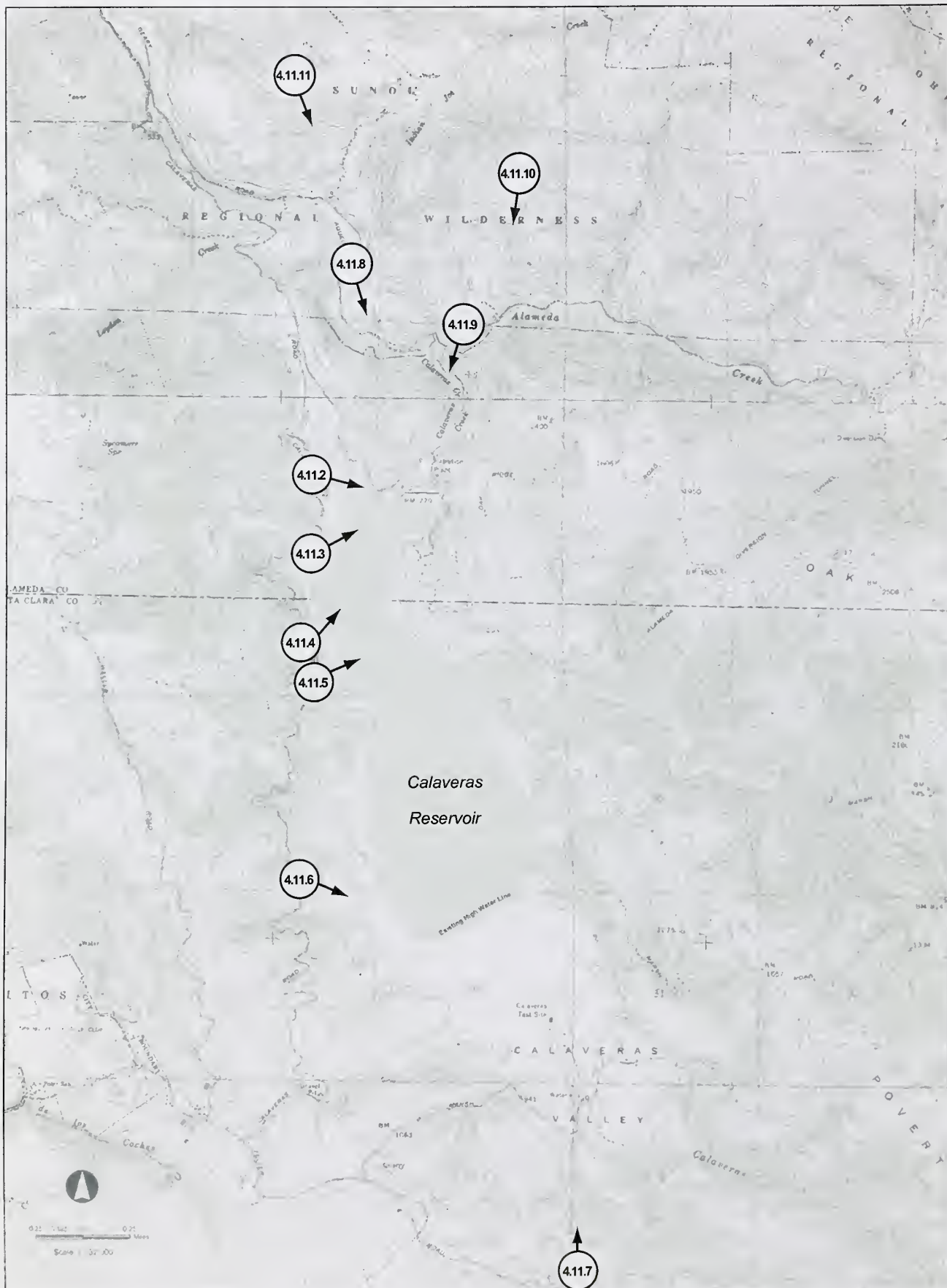
Approaching the northern end of the reservoir traveling south along Calaveras Road, views of the reservoir are intermittent and short in duration due to switchbacks in the road and a cover of vegetation. Along this narrow and winding road, situated high above the reservoir, there are very few turnouts or widened shoulders where a motorist or cyclist can safely stop and view the reservoir. However, where views of the reservoir are available from Calaveras Road, they are of high scenic quality.

Views of the upstream face of Calaveras Dam and its Spanish Revival-style Intake Tower and connecting bridge are also intermittently available across the reservoir from points along Calaveras Road. The Intake Tower is a distinctive visual feature of the built environment in this otherwise undeveloped, “natural” setting, although it does not define the visual character of the reservoir setting. Where visible from Calaveras Road, the visual prominence of the Intake Tower, in the context of the expansive landscape setting, is limited by distance. Closer views of the Intake Tower are not available to the public.

Figure 4.11.1: Viewpoint Locations, shows the approximate location from which photographs of the views that are discussed below were taken, and the direction of the view.

In Figure 4.11.2: View of the North End of Calaveras Reservoir Looking East from Calaveras Road, the narrow northernmost tip of Calaveras Reservoir is visible in the foreground. Just beyond, the western face of Observation Hill rises steeply in the middle ground. Oak Ridge rises in the background. Calaveras Dam is obscured by Observation Hill in this view, but the top of the Intake Tower at the dam is visible in the distance (about 0.4 mile away), beyond the foot of Observation Hill.

Proceeding south along Calaveras Road through switchbacks on the steep banks along the western edge of the reservoir, a view of the upstream face of the dam becomes visible through breaks in the cover of vegetation (see Figure 4.11.3: View of Calaveras Dam Looking Northeast from Calaveras Road). In this view, the western and southern face of Observation Hill, the Intake Tower, spillway, and crest of the dam (about 0.5 mile away) are visible, framed by vegetation. Oak Ridge rises beyond the dam.



SOURCE: EDAW&Turnstone JV

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.11.1: VIEWPOINT LOCATIONS



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.11.2: VIEW OF THE NORTH END OF CALAVERAS RESERVOIR LOOKING EAST FROM CALAVERAS ROAD



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.3: VIEW OF CALAVERAS DAM
LOOKING NORTHEAST FROM CALAVERAS ROAD**

Further south along Calaveras Road, Hill 1000 is revealed from behind Observation Hill. (See Figure 4.11.4: View of Calaveras Dam and Hill 1000 Looking Northeast from Road.¹) In this view, Observation Hill, Hill 1000, Calaveras Dam and Intake Tower (about 0.9 mile away) are visible in the middle ground. Cerro Este (East Hill), in the Sunol Wilderness, rises steeply in the background.

Looking east across the reservoir from Calaveras Road, the watershed keeper's residence (about 0.7 mile away) is visible on Corral Point at the foot of Oak Ridge (see Figure 4.11.5: View of Watershed Keeper's Residence Looking East from Calaveras Road).

Crossing the county line into Santa Clara County, Calaveras Road veers away from the reservoir. The terrain opens up into grassland and more distant views of the southern portion of the reservoir reveal themselves over gentler terrain (see Figure 4.11.6: View of the Southern Portion of Calaveras Reservoir Looking Southeast from Calaveras Road). The flat area of Calaveras Valley just south of the current water line is visible in this view (about 0.7 mile away). Poverty Ridge rises beyond the eastern bank of the reservoir, with Oak Ridge rising beyond Poverty Ridge.

As Calaveras Road veers further away from the reservoir at its southern end, views of the reservoir are lost due to intervening topography. Turning east onto Felter Road (also designated a Santa Clara County Scenic Road) and rising into the Los Buellis Hills, a panoramic view of the reservoir to the north and its surroundings is revealed (see Figure 4.11.7: View of Calaveras Reservoir Looking North from Felter Road). The reservoir dominates this view. The broad, flat alluvial plain at the southern end of the reservoir, exposed since 2001 by the reduced reservoir water level, is now covered by grass. Calaveras Dam and Hill 1000 are obscured behind the foot of Oak Ridge. Observation Hill (about 4.5 miles away) is visible, rising from behind the foot of Oak Ridge. Visible in the background are features within the Sunol Wilderness, like Flag Hill, Cerro Este, and Maguire Peaks. Sunol Ridge is visible in the distant background. In this view looking north, consistent with the pattern of vegetation described earlier, south- and west-facing slopes are covered by grasses and scattered oaks. Along ridgelines, however, the edges of oak woodlands covering north- and east-facing slopes are visible as linear elements, enhancing the readability of the topography. Rural residences are scattered along Felter Road and the private roads that feed into it. Many of these residences have panoramic private views of portions of Calaveras Reservoir and its surroundings.

¹ Note that this particular view is not readily available to travelers along Calaveras Road. The photograph was taken while standing on a roadside barrier, with telephoto magnification, over a cover of vegetation. However, it is representative of intermittent views that are available through gaps in vegetation along this middle segment of Calaveras Road.



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.11.4: VIEW OF CALAVERAS DAM AND HILL 1000 LOOKING NORTHEAST FROM CALAVERAS ROAD



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.5: VIEW OF WATERSHED KEEPER'S RESIDENCE
LOOKING EAST FROM CALAVERAS ROAD**



SOURCE: EDAW&Tumstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.6: VIEW OF THE SOUTHERN PORTION OF
CALAVERAS RESERVOIR LOOKING SOUTHEAST
FROM CALAVERAS ROAD**



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.7: VIEW OF CALAVERAS RESERVOIR
LOOKING NORTH FROM FELTER ROAD**

Views of the Project Site from Sunol Wilderness

Existing scenic views of the Calaveras Dam and Reservoir from the Sunol Wilderness are of particularly high scenic value. The park brochure for Sunol Wilderness cites views of Calaveras Reservoir as among the attractions of the park (EBRPD 2005). Recreational users of the trails of the Sunol Wilderness should therefore be considered particularly sensitive receptors to changes in the visual quality of scenic views from the park. Presumably, a primary reason for their presence in the park is that of enjoyment of the natural and scenic visual qualities available from the park, and to seek visual relief from the built environment.

Calaveras Dam and Reservoir are not visible from the lowland areas of the park on the Sunol Valley floor or from Camp Ohlone Road along Alameda Creek (closed to general vehicular traffic). (See Figure 4.11.8: View of Observation Hill Looking Southeast from Southern End of Sunol Wilderness Parking Lot.) In this view toward Calaveras Dam (about 1.3 miles away), the peak of Observation Hill (middle) is visible rising from behind the foot of Cerro Este (left). Calaveras Dam is located on the far side of Observation Hill.

Heading toward Calaveras Dam on Camp Ohlone Road along Alameda Creek, the view toward the dam is blocked by the densely vegetated north face of Observation Hill / Hill 1000 rising steeply from the south bank of Alameda Creek. Near the convergence of Alameda Creek and Calaveras Creek at Little Yosemite, a popular visitor's destination, views of the dam continue to be obscured by topography and vegetation (see Figure 4.11.9: View of Hill 1000 Looking South from Little Yosemite). In this view toward the dam (about 0.8 mile away), the foot of Oak Ridge (left) obscures views of Calaveras Creek upstream toward the dam. The peak of Hill 1000 and its exposed rock face (about 0.3 mile away) are visible rising beyond the foot of Oak Ridge (this site was used as a source of materials for the existing dam and would again be quarried for materials for the CDRP).

Views of the reservoir and dam are available from multiple vantage points along upland hiking trails within the Sunol Wilderness and the views discussed herein are representative of those views. Views of Calaveras Dam and Reservoir from the Sunol Wilderness are available from trails on the south-facing slopes of Cerro Este opposite the dam (particularly from Cerro Este Road, McCorkle Trail, and Canyon View Trail). (See Figure 4.11.10: View of Existing Dam Site Looking Southwest from Cerro Este.) Consistent with the pattern of vegetation described earlier, the south-facing slope of Cerro Este in the foreground is grass-covered, while the north- and east-facing slopes across Alameda Creek and across the reservoir are covered with denser oak woodlands. Alameda Creek at the foot of Cerro Este is obscured by a dense cover of riparian vegetation. In this view, the dam is seen in the gap between Oak Ridge to the east (left) and Observation Hill to the west (right) behind Hill 1000 (about 1.9 miles away in this view although closer and farther views are



SOURCE: EDAW&Turnstone JV, 2/16/2008

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.8: VIEW OF OBSERVATION HILL
LOOKING SOUTHEAST FROM SOUTHERN END
OF SUNOL WILDERNESS PARKING LOT**



SOURCE: EDAW&Turnstone JV, 2/16/2008

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.9: VIEW OF HILL 1000 LOOKING SOUTH
FROM LITTLE YOSEMITE**



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.10: VIEW OF EXISTING DAM SITE
LOOKING SOUTHWEST FROM CERRO ESTE**

available). The Santa Cruz Mountains are visible, rising in the distant background. The dam is cut into regularly spaced, horizontal “benches” (or terraces). These features are bare of vegetation and create visual discontinuity with the irregular and sloped natural landforms in the vicinity and with the pattern of oak woodland vegetation on other north-facing slopes in the immediate vicinity of the dam. While the dam and benches are prominent in this and other views from the park, they are not visually dominant in the context of the overall landscape given the visually subordinate (lower) position of the dam and the overall expansiveness of the view. Flag Hill is a popular hiker’s destination offering panoramic views of the southern portion of Sunol Valley (see Figure 4.11.11: View of Observation Hill Looking Southeast from Flag Hill). In this view, the rock outcropping atop Flag Hill is visible in the foreground. In the valley below are the developed visitor facilities of Sunol Wilderness. Alameda Creek and tributary streams run through the valley and are marked by a dense cover of riparian vegetation forming linear patterns in the valley. In this view Calaveras Dam (about 2.2 miles away) and much of the reservoir are obscured behind Observation Hill and Hill 1000 (as with other southeast-facing views from upland trails and trail segments that are located northwest of the dam). Oak Ridge rises beyond Observation Hill and Hill 1000. The Los Buellis Hills at the south end of the reservoir and, beyond them, the Santa Cruz Mountains are visible in the distant background.

4.11.1.3 REGULATORY FRAMEWORK

The *Alameda Watershed Management Plan* provides a policy framework to guide SFPUC decisions about the appropriateness of activities on SFPUC Alameda Watershed lands (SFPUC 2001). Design Guidelines for construction activities and policies aimed at protecting and restoring the vegetation of the watershed are included in the *Alameda Watershed Management Plan*. The following guidelines and policies are particularly applicable to potential impacts of the Calaveras Dam Replacement Project related to visual resources:

- Action des 5A: Where grading is necessary, slopes and landforms shall be contoured to mimic the surrounding environment as much as possible.
- Action des 5B: Design and site new roads and trails to minimize grading and the visibility of cut banks and fill slopes.
- Action des 5F: Exterior lighting shall be directed downward and sited and shielded such that it is not highly visible or obtrusive.
- Action des 5G: The silhouettes of new structures shall remain below the skyline of bluffs, cliffs or ridges.
- Action Veg 4: Prior to initiation of any construction project involving grading, a grading plan shall be prepared by the project proponent and approved by appropriate SFPUC staff. Revegetation of all graded areas shall be required to the maximum extent practicable.



SOURCE: EDAW&Turnstone JV, 5/12/2006

CALAVERAS DAM REPLACEMENT PROJECT

**FIGURE 4.11.11: VIEW OF OBSERVATION HILL LOOKING
SOUTHEAST FROM FLAG HILL**

4.11.2 IMPACTS

4.11.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to visual quality, but generally considers that implementation of the project would have a significant impact related to visual quality if it were to:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and other features of the built or natural environment that contribute to a scenic public setting;
- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area or which would substantially impact other people or properties.

4.11.2.2 APPROACH TO ANALYSIS

For the purposes of this section, the study area for visual impacts includes the scenic county roads in the vicinity of the reservoir (Calaveras Road and Felter Road) and the public open space immediately to the north of the dam site (Sunol Wilderness, about 0.3 mile north of the project work site). Project-related changes in views of the project site may also be discernable from other public roads or other public open spaces (like Ohlone Wilderness Regional Preserve [Ohlone Wilderness], about 2.5 miles east of the project work site; Mission Peak Regional Preserve, about 1.6 miles west of the project work site; and Ed R. Levin County Park, about 1.6 miles west of the project work site). To the extent that the project site may be visible at all from other public areas, the visual impacts on views from these areas would be similar in character to those described in this section, although lessened in degree by greater distance, intervening topography and vegetation, and the lowered position of the project work site in the landscape.

4.11.2.3 PROJECT IMPACTS

Table 4.11.1 summarizes the project-related impacts on visual resources described in this section.

Table 4.11.1: Summary of Visual Resources Impacts

Impact	Level of Significance
4.11.1: Impact of construction activities on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.	SU (temporary)
4.11.2: Impact of site disturbance on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.	SU
4.11.3: Impact of project operations on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.	LS
4.11.4: Impact of construction activities and site disturbance on scenic views from county roads.	LS
4.11.5: Impact of construction activities on nighttime light conditions.	LS
4.11.6: Impact of project operations on scenic views from county roads.	LS
<i>Notes:</i> LS – Less than significant SU – Significant unavoidable	

Impact 4.11.1: Impact of construction activities on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.

Construction activities in the vicinity of the proposed dam construction site would be visible from some areas within Sunol Wilderness, as discussed below.² Such activities include the following:

- The dam foundation would be excavated (about 2.32 million cubic yards of material).
- The landslides at the east abutment (left side when facing the dam looking south), downstream from the existing dam, would be stabilized with a tie-back wall.
- The eastern face of Observation Hill, including its peak, and portions of Hill 1000 would be removed to excavate the spillway (about 1.87 million cubic yards of material). The excavated area would be graded into a series of benches.
- Borrow Area B, just north of the peak of Hill 1000 (site of the old quarry used to obtain materials for the existing dam), would be excavated (about 1.30 million cubic yards of material, covering about 8 acres) as a source of construction materials.
- Staging areas on Observation Hill and Hill 1000 (Staging Areas 5, 7, 8, and 10) would be cleared of their existing cover of oak woodland and graded to store materials and equipment during construction.

² The proposed construction activities in other areas (e.g., staging areas along Calaveras Road, the west haul road, Disposal Sites 3,5, and 7, and activities at the southern end of the reservoir would not be prominent, if visible at all, when viewed from Sunol Wilderness. Their visual impact would be minimized by distance and/or obscured by topography. Likewise, the construction site for proposed modifications to the Alameda Creek Diversion Dam would not be prominent, if visible at all, to hikers along Camp Ohlone Road. Its visual impact would be minimized by distance (about 300 feet from the road), by its lowered position in the landscape along the creekbed, and by intervening vegetation.

- Access areas on Observation Hill and Hill 1000 (covering about 23.1 acres) would be cleared of their existing cover of oak woodland and graded for use by vehicles and equipment to access the construction site, Borrow Area B, and staging areas.
- New haul roads would be constructed, and existing roads would be widened on Observation Hill and Hill 1000 for use by vehicles and equipment to serve the construction areas, Borrow Area B, and staging areas.
- The replacement dam would be constructed approximately 1,000 feet downstream (north) of the existing dam. The existing dam would function as a cofferdam during construction of the replacement dam. At the end of construction, an approach channel would be excavated through the west side of the cofferdam. The remaining portion of the cofferdam would be left in place.

The construction site of the proposed dam would be particularly visible from upland trails on the south face and ridgeline of Cerro Este, where views of the existing dam are currently available (Cerro Este Road, McCorkle Trail, and Canyon View Trail). See, for example, Figure 4.11.10, which shows the existing dam viewed from the Cerro Este Road. Even from park locations where views of the existing dam and dam construction site are obscured by topography or vegetation, the proposed construction activities at the peak of Observation Hill (spillway excavation, benching, and access road) and on Hill 1000 (stilling basin excavation, borrow material, benching, and access road) would be visible from the many areas of the park where views of these features are now available (including the developed park visitor facilities in Sunol Valley, portions of Camp Ohlone Road, High Valley Camp, High Valley Road, and Hayfield Road). See, for example, Figure 4.11.8, which shows the north-facing peak of Observation Hill as seen from a Sunol Wilderness parking lot.

Typical of large construction sites, viewers would generally perceive high levels of activity and movement. Outside of construction hours, viewers would continue to perceive the visual disruption of work in progress and the visual clutter of stored equipment and materials. These visual intrusions could impair the enjoyment of views from some portions of the park for the duration of construction (about 4 years). The nature and intensity of these visual changes, as experienced by park visitors, would vary relative to the prominence of the construction activities from the particular vantage point (whether obscured by intervening topography or vegetation), the proximity of the viewer to the areas of work, the position of work within the viewer's line of sight (lowered or elevated), and the subjective sensitivity of the viewer.

To the extent that construction activity would be visible from the highland areas and trails in the northern portion of the park (Flag Hill, Vista Grande Road, Eagle View Trail, Maguire Peaks, and Maguire Peaks Trail), the visual impact of construction work on scenic views from these areas would be lessened relative to their distance from the work areas, the overall expansiveness of views from these areas, and by the lowered position of the construction activity in the valley below. See, for example, Figure 4.11.11, which shows Observation Hill and Hill 1000 as seen from atop Flag Hill.

Hikers in the Sunol Wilderness would perceive high levels of activity and the visual intrusions of stored materials and equipment. As discussed above under “Views of the Project Site from Sunol Wilderness,” recreational users should be considered sensitive receptors to changes in the visual quality of scenic views from the park. For these reasons, construction activity in the area of the dam would substantially impair scenic vistas, scenic resources, and visual character of the reservoir.

Impact Conclusions

This impact, although temporary (about 4 years), would be a significant impact on scenic vistas, scenic resources, and the visual character of the reservoir. Screening through the use of fencing or temporary landscaping around the construction area would be ineffective in this case because of the extensive scale of the project construction area and the large number of vantage points from which construction activities would be visible from the Sunol Wilderness. Further, from these vantage points, screening devices would themselves become a visually intrusive presence. Therefore, this impact would be significant and unavoidable.

Impact 4.11.2: Impact of site disturbance on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.

As described above, project construction activities would have a temporary impact on visual quality for the duration of construction when viewed from various areas and trails in the Sunol Wilderness. Site disturbance resulting from these construction activities would remain after completion of construction and would have a long-term impact on scenic vistas, scenic resources, and visual character when viewed from the same areas and trails of the Sunol Wilderness.

Excavation of the peak of Observation Hill and portions of Hill 1000 (for the spillway) and excavation of Borrow Area B (for construction materials) would permanently alter the profiles of these features when viewed from the Sunol Wilderness. Grading the excavated area of Observation Hill and Hill 1000 into regularly spaced, horizontal benches and the landslide stabilization work would increase the visual discontinuity of the dam complex with the irregular and sloped natural landforms in the vicinity.

These components of the proposed project, along with proposed staging areas, access areas, and haul roads on the north face of Observation Hill opposite the park, would require removal of a large area of existing oak woodland cover. As discussed above under “Local Setting,” a general pattern of oak woodland cover on north- and east-facing slopes is a defining visual feature of the landscape. Removal of this vegetation would create visual discontinuity with the existing pattern of oak woodland cover in the immediate vicinity of the dam on north-facing slopes. Areas of disturbance would be particularly prominent when viewed from upland trails in the Sunol Wilderness (see Figure 4.11.10). As discussed above under “Views of the Project Site from

Sunol Wilderness,” recreational users are sensitive receptors to changes in the visual quality of scenic views from Sunol Wilderness. Although fast-growing grasses and scrub would take hold to cover the disturbed areas, the new areas of grassland and scrub would be different in visual character from the remaining oaks, particularly in the dry summer and autumn months when their golden color would contrast with the color of the oaks. Because recovery of oak woodland on these disturbed areas could require decades, the visual discontinuity in the cover, texture, and color of vegetation would persist for decades as evidence of ground disturbance. Restoration would not be feasible in all areas where oak woodland would be lost, particularly in areas where steep grade conditions of exposed bedrock would preclude the replanting and survival of oaks. The impact of site disturbance from the excavation of Observation Hill and Hill 1000, the benching of the slopes of Observation Hill and Hill 1000 after excavation, long periods without oak woodland where restoration is possible and the inability to restore oak woodlands to benched areas would extend beyond the construction phase and would be considered a long-term visual impact of the project.

Impact Conclusions

Site disturbance caused by the excavation and grading of Observation Hill and Hill 1000, and the excavation of Borrow Area B would have a significant impact on scenic vistas from the park, and on scenic resources and the visual character of the dam site and its surroundings for decades after construction is complete. Implementation of policies of the *Alameda Watershed Management Plan*, calling for site and vegetation restoration (i.e., Action des 5A: contour to mimic surrounding landforms; and Action Veg 4: revegetate graded areas) would occur as part of the proposed project. These efforts would lessen the impact on scenic views from Sunol Wilderness as would implementation of Vegetation and Wildlife Mitigation Measure 5.4.2, Habitat Restoration Measures (see Chapter 5). However, full restoration would not be feasible within the spillway excavation on Observation Hill and Hill 1000. The slopes of these areas would be excavated to bedrock and benched to stabilize them. The benched slopes on exposed bedrock would not lend themselves to replanting with oak woodland and would not retain the same visual character that exists now. This impact would therefore be considered significant and unavoidable.

Impact 4.11.3: Impact of project operations on scenic vistas, scenic resources, and visual character when viewed from the Sunol Wilderness.

The proposed project would replace public views of the existing Calaveras Dam and Reservoir from the Sunol Wilderness with views of a new dam downstream from the existing dam (about 1,000 feet north of the existing dam measured from dam crest to crest). The existing dam would function as a cofferdam during construction of the replacement dam. At the end of construction, an approach channel would be excavated through the west side of the cofferdam. The remaining portion of the cofferdam would be left in place and would extend from the east abutment into the

water behind the new replacement dam. The proposed replacement dam would be comparable in size and volume to the existing dam (see Table 3.1, in Chapter 3, Project Description, which compares the existing dam with the proposed replacement dam). Because the dam would be about 1,000 feet closer to Sunol Wilderness, it would appear somewhat larger to viewers within the park. Like the existing dam, the replacement dam itself would not be visually dominant in the overall context of the landscape given its lowered position in the landscape and the expansiveness of views from the Sunol Wilderness.

Operation of the proposed replacement dam would entail restoring the water level of the reservoir to pre-DSOD restricted levels. This change would increase the area of water coverage at the perimeter of the reservoir (particularly at the southern end of the reservoir). As discussed above under “Calaveras Reservoir and Valley,” bodies of water are generally considered features that enhance the visual quality of their setting. By extension, increasing the area of water coverage would enhance, rather than detract from, the visual quality of the reservoir setting.

Impact Conclusions

Operation of the new replacement dam would not substantially impair scenic vistas from the Sunol Wilderness, or scenic resources and the visual character of the dam site and its surroundings. Impacts of the completed replacement dam structure and its operation on the scenic quality of views from the Sunol Wilderness would therefore be less than significant.

Impact 4.11.4: Impact of construction activities and site disturbance on scenic views from county roads.

As described in Subsection 3.5.1.7, Access and Roads, in Chapter 3, Project Description, Calaveras Road (between Geary Road and Felter Road) would be closed to the public on weekdays for hauling of imported materials (approximately 2 months in the summer of 2011, and 18 months beginning in the winter of 2012) and may also be closed on other days outside of these periods when air quality monitoring indicates unacceptable levels of dust.

The construction activities in the vicinity of the proposed replacement dam would be largely obscured by Observation Hill and would not be prominent, if visible at all, from county roads in the vicinity of the project. Site disturbance visible from roads in the vicinity of the project (Calaveras Road, Marsh Road, and Felter Road) would result more from the following project construction activities:

- Borrow Area E, located at the south end of the reservoir, would be excavated (about 1.74 million cubic yards of material, covering about 85 acres) to obtain materials for the replacement dam. The site would be covered by water upon restoration of water levels with project operation.

- Disposal Site 5 would be located in Borrow Area E and would receive excess materials (about 840,000 cubic yards, covering 60 acres). The site would be covered by water upon restoration of water levels with project operations.
- Temporary barge dock facilities (if the barge option is selected) would be constructed at the southern and northern ends of the reservoir (covering about 2.5 acres). The docks would be removed upon project completion.
- Disposal Site 3 would be located at the western foot of Observation Hill alongside Calaveras Road and would receive excess materials (about 2.25 million cubic yards, covering 39 acres). Part of the site (about 7.3 acres) would be covered by water upon restoration of water levels with project operation.
- Disposal Site 7 would be located on the terrace on the east side of the reservoir at Corral Point near the watershed keeper's residence and would receive excess materials (about 1.06 million cubic yards, covering 17 acres).
- Some temporary staging areas, particularly Staging Areas 1, 2, 3, 4, and 6, would be located along Calaveras Road, north of the reservoir. These would be restored upon project completion.
- New temporary haul roads would be constructed along the existing western shoreline of the reservoir to serve Borrow Area E and Disposal Site 5 (about 3.4 miles, covering 35 acres), to the east of the reservoir to serve Disposal Site 7 (about 1.0 miles, covering 0.3 acre).
- The Borrow Area E Access Road to the south of the reservoir would be constructed (about 0.69 mile, covering 3 acres).
- The existing dam would be partially demolished and the Intake Tower and bridge would be demolished.

Views of construction activities and ground disturbance at Borrow Area E / Disposal Site 5, the barge dock facilities at the southern end of the reservoir if the barging option is selected, and the new temporary haul road along the entire length of the existing western shoreline of the reservoir would be available to the public from Calaveras Road. (See Figure 4.11.6, which shows the existing view of the south end of the reservoir from Calaveras Road.) Construction activities would also be visible in the distance from Felter Road in the hills to the south of the reservoir. (See Figure 4.11.7, which shows the existing view over the south end of the Reservoir from Felter Road.) Borrow Area E / Disposal Site 5, the barge dock site, and the proposed haul road along the western shoreline of the reservoir would be submerged upon restoration of the reservoir's water level at completion of the proposed project and would no longer be visible.

Site disturbance resulting from Disposal Sites 3 and 7, staging areas along Calaveras Road, and temporary haul roads east of the reservoir on Corral Point are largely located in existing grasslands and chaparral. (See Figure 4.11.5, which shows the existing view of Corral Point [the proposed location of Disposal Site 7] across the reservoir from Calaveras Road. See also Figure 4.11.2, which shows the existing view of the western foot of Observation Hill as viewed from Calaveras Road.) The western foot of Observation Hill is the proposed location of Disposal

Site 3. These areas would be contoured and re-vegetated at completion of the proposed dam to blend with adjacent ground in implementation of SFPUC *Alameda Watershed Management Plan* Action des 5A (contouring slopes to mimic surrounding environment), and Action Veg 4 (requiring revegetation of all graded areas to the maximum extent practicable). The cover of vegetation in these areas of grassland and chaparral could recover relatively quickly (within a few years) to minimize visual evidence of disturbance and the impact on scenic views from Calaveras Road.

Demolition of the Intake Tower and bridge would remove a distinctive visual feature in the landscape to which frequent users of Calaveras Road may have become accustomed. However, as discussed above, the Intake Tower does not define the visual character of the reservoir's setting due to its distance from publicly accessible vantage points.

Impact Conclusions

Construction activities, site disturbance, and the removal of the Intake Tower would not substantially impair scenic resources or degrade the visual character of the reservoir as viewed from county roads. This impact would therefore be considered less than significant.

Impact 4.11.5: Impact of construction activities on nighttime light conditions.

Nighttime construction activities associated with project implementation would require nighttime illumination, resulting in temporary increases in nighttime light levels perceptible from residences and may also be perceptible from at least one overnight camping area within Sunol Wilderness. These receptors can be considered sensitive to nighttime light and glare.

As described in Subsection 3.5.5, Construction Schedule and Cost, in Chapter 3, Project Description, construction activities are proposed to occur 20 hours per day (consisting of two 10-hour shifts per day), 6 days per week. Equipment maintenance and repair would occur at various times 24 hours per day, 7 days per week. Hauling of materials from off site may occur at night between 5 p.m. and 7 a.m. Monday through Friday. In addition, equipment maintenance and repair activities would occur at various times at some staging areas 24 hours per day, 7 days per week.

Temporary construction lighting would be required in all areas where nighttime construction would take place, for security of stored equipment and materials, and for nighttime equipment maintenance. The location and type of lighting would vary depending on the location and nature of the activities taking place during any particular construction phase.

Construction areas at the south end of the reservoir (Borrow Area E, Disposal Site 5, Staging Area 11, and the barge dock if barging is selected) would have the potential to affect residential sensitive receptors. The closest of these are about 0.75 to 1 mile away from construction areas at

the south end of the reservoir. A number of residences along Felter Road (and private roads feeding Felter Road) in the hills south of the reservoir have distant direct views of these construction areas. In conformity with the *Alameda Watershed Management Plan* Action des 5F, construction lighting would be shielded from residential properties.

Some indirect light (light reflected off of surfaces, and off of particles and moisture in the air) would be visible to nearby residents as a “glow” when viewing the site at night. The nighttime glow of illuminated construction areas in Calaveras Valley would temporarily change the rural nighttime visual character of the area. Nighttime light levels would not exceed typical levels accepted by residents of more developed areas. At completion of construction, lighting would no longer be used and light levels would return to existing conditions.

Construction areas at the north end of the reservoir (the proposed dam site, various staging areas and Borrow Area B) would also have the potential to affect recreational sensitive receptors in the Sunol Wilderness. The glow of the lighted construction areas could be visible from an upland campsite like High Valley Camp (about 1.5 miles north of these construction areas) and could affect the wilderness experience of overnight campers.

Because of the distance from the campsite to lighted construction areas, and because sources of direct light would be contained by their lowered position in the valley below, construction lighting, if visible at all, would not substantially interfere with nighttime camping activities. At completion of construction, lighting would no longer be used and light levels would return to existing conditions.

Impact Conclusions

The proposed project would not generate intrusive amounts of light and glare for residential or recreational receptors. Therefore, the impact of nighttime construction lighting on residential and recreational receptors would be less than significant.

Impact 4.11.6: Impact of project operations on scenic views from county roads.

The proposed replacement dam, located about 1,000 feet further downstream (north) of the existing dam, would be partially obscured by Observation Hill when viewed from points along Calaveras Road. Its upstream (south) face and the portions of the existing dam that would remain in place would be largely covered by water upon restoration of pre-DSOD restricted water levels. Proposed ancillary structures that would be constructed at the northern end of the reservoir (like the proposed 30-foot-tall intake shaft, and the proposed 1-story, 14-by-33-foot electrical equipment building) would be utilitarian in character and comparable in scale to existing structures. The proposed replacement dam and proposed ancillary structures, like the existing

structures they would replace, would not be prominent, where visible at all, from county roads in the vicinity of the project.

Operation of the proposed replacement dam would entail restoring the water level of the reservoir to pre-DSOD restricted levels. This change would increase the area of water coverage at its perimeter, particularly at the southern end of the reservoir. As discussed above under “Calaveras Reservoir and Valley,” bodies of water are generally considered features that enhance the visual quality of their setting. By extension, increasing the area of water coverage would enhance, rather than detract from, the scenic quality of the reservoir when viewed from county roads. While beneficial overall to the visual character of the dam setting, operation of the dam would result in wider fluctuations of water levels than currently exists under restricted conditions, leaving a wider ring of exposed barren land at the reservoir’s edges when the water level is lowered.

Impact Conclusions

This impact would be considered less than significant.

REFERENCES

Alameda County. 1994. *Alameda County General Plan*, Scenic Route Element, May 1966, amended May 1994.

East Bay Regional Park District (EBRPD). 2005. “Sunol Regional Wilderness” Park Brochure and Map, March 2005.

San Francisco Public Utilities Commission (SFPUC). 2001. *Final Alameda Watershed Management Plan*. Prepared by EDAW, Inc. in association with Environmental Science Associates, Montgomery Watson, Public Affairs Management, and Wildland Resource Management. April 2001.

Santa Clara County. County Zoning Code Section 3.30.010, *et seq.*

4.12 TRANSPORTATION AND CIRCULATION

Section 4.12 Contents	
4.12.1 Setting	4.12.2 Impacts
4.12.1.1 Roadway Network	4.12.2.1 Significance Criteria
4.12.1.2 Traffic Volumes	4.12.2.2 Approach to Analysis
4.12.1.3 Transit Service	4.12.2.3 Project Impacts
4.12.1.4 Pedestrian and Bicycle Circulation	
4.12.1.5 Regulatory Framework	

This section presents the results of the transportation assessment conducted for the proposed project. It describes the transportation conditions within the vicinity of the project site, presents an assessment of the transportation impacts associated with construction activities, and identifies recommended measures to mitigate potentially significant adverse impacts to less-than-significant levels.

The evaluation of the transportation impacts was based on the following: field reconnaissance of roads that would be used for construction; traffic volume data obtained from state and county agencies; traffic volume counts conducted in October 2006 and in February and August 2007 on roadway segments that would experience the greatest number of construction-generated vehicle trips; and information on anticipated construction activities obtained from the San Francisco Public Utilities Commission (SFPUC).

4.12.1 SETTING

The project area lies within Alameda and Santa Clara Counties. The project area analyzed for the transportation assessment includes the roadway network, consisting of the regional highways and local roadways, which would be used for access by construction workers and construction vehicles. Figure 4.12.1, Project Area Roads, shows the project area roadways.

4.12.1.1 ROADWAY NETWORK

Regional access to the project area is provided by Interstate 680 (I-680), located approximately 7 miles to the north of the dam. I-680 is a four-to-eight-lane freeway that extends between I-280 and U.S. 101 in San Jose, and I-80 in Fairfield. I-680 serves as a primary north-south regional route, connecting the Livermore-Amador Valley with Contra Costa County and Santa Clara Valley. Access to I-680 in the project area is via on- and off-ramps at Calaveras Road and Paloma Way in Alameda County, and East Calaveras Boulevard in Santa Clara County.



SOURCE: EDAW&Turnstone JV

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 4.12.1: PROJECT AREA ROADS

Calaveras Road provides the primary access to the project area from both north and south of the dam. Between I-680 and Geary Road (north of the dam), Calaveras Road is a two-lane roadway (one lane in each direction). For 5 miles east of I-680, Calaveras Road has relatively flat grades and a straight alignment. The posted speed limit on Calaveras Road is 50 miles per hour (mph) between I-680 and Geary Road, 25 mph between Geary Road and Felter Road, and 35 mph between Felter Road and East Calaveras Boulevard/Evans Road in Milpitas.

Between Geary Road and Felter Road (west and south of the dam), Calaveras Road is a one-lane, winding mountain roadway serving the Sunol Wilderness Regional Preserve and Calaveras Reservoir and Dam. Between Felter Road and Evans Road (south of the dam and reservoir), Calaveras Road is a two-lane roadway (one lane in each direction). To the west of Evans Road, Calaveras Road extends into Milpitas as East Calaveras Boulevard, and connects with Highway 237 and I-680.

4.12.1.2 TRAFFIC VOLUMES

Weekday traffic on I-680 consists primarily of commute traffic in the peak traffic periods (generally between the hours of 7 and 9 a.m., and 4 and 6 p.m.), and a mix of residential, commercial, and industrial traffic throughout the day. The most recent data published by the California Department of Transportation (Caltrans) for 2008 indicate that in the vicinity of the project area, the average daily traffic volumes on I-680 are about 147,000 vehicles per day at Calaveras Road/Paloma Way, and about 146,000 vehicles per day at East Calaveras Boulevard (Caltrans 2008). Trucks are about 7 percent of the total daily traffic volumes (Caltrans 2007).

Weekday daily traffic volumes on the two-lane segment of Calaveras Road between I-680 and Geary Road are between 1,100 and 1,300 vehicles per day, and peak hour traffic volumes are about 80 vehicles during the a.m. peak hour and 100 vehicles during the p.m. peak hour. This section of Calaveras Road serves as a haul route for the existing aggregate sand and gravel quarry operations in the area. On Calaveras Road between Geary and Felter Roads, weekday daily traffic volumes are between 100 and 400 vehicles per day. The average daily traffic volumes on Saturdays are about 1,150 vehicles per day on the segment between I-680 and Geary Road, and between about 150 and 300 vehicles per day between Geary and Felter Roads (ETJV 2007).

4.12.1.3 TRANSIT SERVICE

Alameda County Transit (AC Transit) is the principal bus service provider in Alameda County, while Santa Clara Valley Transportation Authority (VTA) is the primary transit provider in Santa Clara County. There is no regularly scheduled bus service by either AC Transit or VTA along Calaveras Road.

4.12.1.4 PEDESTRIAN AND BICYCLE CIRCULATION

Bikeways are typically classified as Class I, Class II, or Class III facilities.¹ Class I bikeways are bike paths with exclusive right-of-way for use by bicyclists and pedestrians. Class II bikeways are bike lanes striped within the paved areas of roadways and established for the preferential use of bicycles, while Class III bikeways are signed bike routes that allow bicycles to share streets or sidewalks with vehicles or pedestrians. Calaveras Road north of the dam is not part of the designated Alameda Countywide Bicycle Network (Alameda County CMA 2006). However, the East Bay Bicycle Coalition has identified Calaveras Road between I-680 in Alameda County, and East Calaveras Boulevard/Evans Road in Santa Clara County as an on-road route recommended for bicycle travel (East Bay Bicycle Coalition 2005). The Santa Clara Valley Bikeways map identifies Calaveras Road between Felter Road and Evans Road in Milpitas as a designated bicycle route (Class III facility) (Santa Clara VTA 2005b). Calaveras Road experiences considerable recreational bicycle travel on weekends, while bicycle volumes are generally low on weekdays.

There are no pedestrian facilities on Calaveras Road. Pedestrian volumes are very low throughout the day, as the predominant mode of travel in the area is by automobile.

4.12.1.5 REGULATORY FRAMEWORK

Transportation analysis in California is guided by policies and standards set at the state level by Caltrans, as well as by local jurisdictions. Jurisdictions regulate speed limits and other driving standards on local roadways. There are no federal regulations that address transportation impacts associated with the proposed project. Policies regarding traffic service levels apply to long-term, not short-term, traffic conditions. Plans and policies related to transportation aim to accommodate future growth and the vehicular, transit, pedestrian, and bicycle travel demand associated with that growth. These policies generally specify maintaining a level of service² (LOS) of LOS D on major streets during the peak periods of traffic flow, and require mitigation measures when project-specific impacts are projected to result in a LOS exceeding the threshold.

The LOS standards for roadways in the Alameda County Congestion Management Program (CMP) and the Santa Clara County CMP network vary by roadway segment and are generally LOS E or LOS F. Calaveras Road is not part of the CMP network within either Alameda or Santa Clara Counties (Alameda County CMA 2009; Santa Clara VTA 2005a).

¹ Bicycle facilities are defined by the State of California, in the California Streets and Highway Code Section 890.4.

² Level of Service (LOS) is a qualitative description of a facility's performance based on average delay per vehicle, vehicle density, or volume-to-capacity ratios. Level of service ranges from LOS A, which indicates free-flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays.

For traffic safety reasons, the SFPUC would request permission from Alameda County to close the section of Calaveras Road between a point immediately south of the intersection with Geary Road (south of the SVWTP) and a point near the Santa Clara County line (south of the dam access road) during two periods as described below. In addition, the SFPUC would request permission from Santa Clara County to close the portion of Calaveras Road between the Alameda County line and Felter Road (near the south end of the reservoir) during the same two periods. The closure would require approvals, via encroachment permits, from both Alameda and Santa Clara Counties. The requirements for permits are found in Alameda County Municipal Code Title 12 Chapter 12.08, Roadway Use Regulations, and Santa Clara County Ordinance Code Division B17, Chapter II, Article 1, Encroachment Permits.

4.12.2 IMPACTS

4.12.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to transportation and circulation, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);
- Exceed, either individually or cumulatively, a LOS standard established by the county congestion management agency for designated roads or highways (unless it is practical to achieve the standard through increased use of alternative transportation modes);
- Result in a change in air traffic patterns, including either an increase in traffic levels, obstructions to flight, or a change in location, that results in substantial safety risks;
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses;
- Result in inadequate emergency access;
- Result in inadequate parking capacity that could not be accommodated by alternative solutions; or,
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., conflict with policies promoting bus turnouts, bicycle racks, etc.), or cause a substantial increase in transit demand which cannot be accommodated by existing or proposed transit capacity or alternative travel modes.

4.12.2.2 APPROACH TO ANALYSIS

This impact assessment evaluates the potential for project-specific, short-term construction-related impacts on roadways resulting from construction-related changes in roadway capacities or increases from construction-related traffic, as well as long-term impacts resulting from operation of the project. Construction of the project is estimated to take approximately 4 years; planned to

begin in 2011. Construction activity would generally consist of two 10-hour shifts per day, 6 days per week.

The assessment of construction-related impacts assumes that the SFPUC or its contractor(s) for the project would obtain any necessary road encroachment permits prior to construction and would comply with the conditions of approval attached to project implementation. The project includes improvements to the existing dam access road and construction of new access roads that would serve as haul routes within the project work area, and for access to public roadways, during construction of the replacement dam (see Table 3.5, Improvements to Project Area Roads, in Chapter 3, Project Description). The access roads that would be improved and the new access roads are on SFPUC land along the perimeter of the dam and reservoir, and are not publicly accessible.

The LOS standards established by county congestion management agencies and documented in congestion management plans are intended to regulate long-term traffic impacts due to future development. They are applicable for development projects and land use plans, and do not apply to temporary construction projects (Alameda CMA 2005; Santa Clara VTA 2005a). The Calaveras Dam project would require periodic operations review and maintenance, similar to existing conditions, and would not generate a significant number of new vehicle trips. Because the project would not result in new long-term impacts on roadways used to access the dam, no further consideration of impacts to LOS on CMP roadways is warranted.

Due to the nature and scope of the project, implementation of the project would not have the potential to change air traffic patterns at any airport in the area. The project would not involve installation of structures that could interfere with air space. Therefore, no further consideration of impacts to air navigation is warranted.

Implementation of the project would not permanently change the existing or planned transportation network in Alameda and Santa Clara Counties, and would therefore not conflict with policies, plans, or programs related to transit, bicycle, or pedestrian travel. Therefore, no further consideration of this impact is warranted.

4.12.2.3 PROJECT IMPACTS

Table 4.12.1 summarizes the project-related impacts on transportation and circulation described in this section.

Table 4.12.1: Summary of Transportation and Circulation Impacts

Impact	Level of Significance
4.12.1: Traffic delays due to temporary lane and road closures during construction.	LS
4.12.2: Short-term traffic increases on area roadways due to construction-related traffic.	LS
4.12.3: Impaired access to adjacent roadways and land uses for emergency service providers.	LS
4.12.4: Increased potential for traffic safety hazards for vehicles and bicyclists on public roadways during construction.	SU
4.12.5: Increased wear and tear on the designated haul routes used by construction vehicles.	LSM
4.12.6: Long-term traffic associated with operation and maintenance of the replacement dam.	LS
<i>Notes:</i> LS – Less than significant LSM – Less than significant with mitigation SU – Significant and Unavoidable	

Construction Impacts

Impact 4.12.1: Traffic delays due to temporary lane and road closures during construction.

Mobilization of equipment and hauling of construction supplies between spring 2011 and summer 2011, and demobilization of equipment and construction supplies between winter 2013 and winter 2014 would require periodic halting of traffic on Calaveras Road between Geary Road and the gate at the beginning of the access road to Calaveras Dam. Intermittent traffic delays would occur when construction equipment is mobilized or large trucks are used to deliver construction supplies to the work area. Flagmen would stop traffic to the south of the existing dam access road and at the intersection of Calaveras Road and Geary Road. Hauling of equipment and supplies to construct jetties or other docking facilities and transport of barges for Borrow Area E Haul Route Option 2 would require halting of traffic on Calaveras Road between Felter Road and the Borrow Area E access road. Flagmen would stop traffic to the north of Borrow Area E access road and at the intersection of Calaveras Road and Felter Road.

Sand and gravel for use as filter and drain materials in the replacement dam would be delivered from off-site commercial sources to the replacement dam site via Calaveras Road during a 2-month period in summer 2011 and for an approximately 18-month period beginning in winter 2012. As further discussed below, Mitigation Measure 5.12.4b requires the SFPUC to seek permission from Alameda County to close the section of Calaveras Road between a point immediately south of the intersection with Geary Road and a point near the Santa Clara County line (south of the dam access road) to through-traffic Monday through Friday except for

emergency vehicles, during the delivery of these materials to avoid potential traffic safety hazards (see Figure 4.12.1). In addition, the SFPUC would request permission from Santa Clara County to close the portion of the road between the Alameda County line and Felter Road during the same two periods; the purpose of this additional measure would be to prevent vehicles that may enter Calaveras Road from the south from needing to turn around at a dead end at the Alameda County line. The SFPUC may also need to request permission to close this section of Calaveras Road in both Alameda and Santa Clara Counties at other times, including weekend days, as a precaution when air quality monitoring indicates levels of dust at the perimeter of the work area exceeds desired levels (see Section 4.9, Hazards and Hazardous Materials for further discussion). The closed portion of Calaveras Road would be swept clean on either Friday evening or Saturday morning, and re-opened for traffic on Saturday and Sunday. This segment of Calaveras Road would be open on all state and national holidays.

There is one private residence located within a 5-acre in-holding that can only be accessed via the Ohlone Trail road from Calaveras Road between Geary Road and the dam access road. The SFPUC proposes to coordinate with the property owner to ensure that access to this residence would be maintained throughout the construction period. Depending on the time of travel, travel times to and from the residence may increase due to construction traffic on the closed portion of Calaveras Road. The potential increase in travel to this one residence during project construction would be a less-than-significant impact.

As stated previously, traffic volume data collected in October 2006 and February 2007 indicated that between 100 and 400 vehicles per day travel on Calaveras Road south of Geary Road on weekdays and between 150 and 300 vehicles per day travel on weekend days. These volumes include operations and maintenance vehicle trips traveling to and from the existing dam, and some vehicles would not be anticipated to detour to other roadways. Therefore, based on counts conducted on Calaveras Road north and south of the dam access road, it is estimated that up to 200 vehicles per day would detour to other roadways, and up to 10 vehicles during the a.m. peak hour and 50 vehicles during the p.m. peak hour. The addition of up to 200 vehicles per day on I-680 and other roadways would increase traffic volumes on these roadways, but would not contribute to a noticeable increase in vehicle delays, as these trips would occur throughout the day and include travel in both directions. The addition of 200 vehicles per day to I-680 would represent a minimal increase in daily traffic volumes on I-680 of about 0.1 percent. Since both directions of I-680 in the vicinity of Calaveras Dam currently operate at LOS D or better conditions during the a.m. and p.m. peak periods (the LOS standard for I-680 is LOS E), the addition of up to 10 diverted vehicle to I-680 during the a.m. peak hour and up to 50 diverted vehicles to I-680 during the p.m. peak hour would not substantially affect the LOS operating conditions on I-680. Through traffic that currently uses Calaveras Road on weekdays would be required to find an alternate route for the duration of the road closure periods, and would likely use I-680, depending on the destination. Drivers using Calaveras Road as a through route would

be inconvenienced, and may experience additional delays in accessing their destination during the construction period. However, since travel speeds on I-680 are generally higher throughout the day than on Calaveras Road, travel times would generally be shorter.³

Additional project-generated construction trucks and construction worker vehicles would potentially affect bicycle travel on Calaveras Road between I-680 and Geary Road. The potential effects of construction-related road closures on recreational bicycling use are addressed in Section 4.3 Land Use, Agricultural Resources, and Recreation.

Impact Conclusion

Temporary lane and road closures during construction would not result in traffic increases that are substantial in relation to the existing traffic loads and capacities or that would exceed the established LOS standards of the affected roadways. Therefore, the impacts on transportation and circulation from construction-related lane and road closures would be less than significant.

Impact 4.12.2: Short-term traffic increases on area roadways due to construction-related traffic.

Construction traffic would result in short-term increases in traffic volumes on roadways in the immediate vicinity of the dam, along access routes north and south of the dam, and along the north haul route. The addition of construction vehicle traffic to the existing roadway volumes, without increasing the capacity of the roadway, could result in increased congestion and delay for vehicles. The presence of construction truck traffic would temporarily reduce roadway capacities due to the slower travel speeds and larger turning radii of trucks. Impacts of construction traffic would be most noticeable in the immediate vicinity of the project site and less noticeable farther away and on regional facilities.

Construction-related vehicle trips would include construction workers traveling to and from the project work area, and haul truck trips associated with materials and equipment deliveries. The number of construction-related vehicles traveling to and from the project work area would vary on a daily basis, depending on the construction phase, planned activity, and materials needs.

Construction vehicle trips associated with excavation of the dam foundation and spillway, transport of fill materials from on-site borrow areas, transport of unusable excavated materials to disposal sites, and construction of the dam embankment would occur within the established work limit area surrounding the dam. These construction truck trips would travel within the established work area and would not travel on any area roadways.

³ Non-peak travel times between East Calaveras Boulevard/I-680 in Milpitas, and Calaveras Road/I-680 in Sunol Valley are about 12 minutes for the 14-mile segment using I-680, and about 35 minutes for the 17-mile segment using East Calaveras Boulevard and Calaveras Road.

As further discussed below, Mitigation Measure 5.12.4b requires the SFPUC to seek permission from Alameda and Santa Clara Counties to close Calaveras Road between Geary and Felter Roads to through traffic Monday through Friday except for emergency vehicles during the two periods that sand and gravel would be delivered. In addition, deliveries of concrete aggregate and miscellaneous equipment would occur throughout the construction period of approximately 4 years. Table 4.12.2 summarizes the number of truck trips generated by the project that would travel to and from off-site locations. There would be between 12 and 172 construction truck trips per day depending on the phase of construction. The number of construction workers driving to the site on a daily basis would vary by construction phase, and would range between 80 and 190 workers (see Table 3.6, Number of Construction Workers by Time Period, in Chapter 3, Project Description, summarized in Table 4.12.2). Depending on the construction phase, these workers would generate between 160 and 380 vehicle trips (including inbound and outbound trips). Overall, the number of short-term vehicle trips generated by the project would range between about 172 and 532 trips per day.

Construction vehicle trips to and from the project work area would be distributed throughout the day. Construction workers would travel prior to and following their work shift. It is anticipated that there would be two 10-hour shifts, with the majority of workers at the project work area during the day shift. The construction contractor would set the work shift hours, based on schedule needs, and such that the day shift would not have to use artificial illumination. The shifts would not overlap and may have a 0.5-hour break between shifts. During summer months, the day shift could occur from 5:30 a.m. to 3:30 p.m., and the night shift could occur from 3:30 p.m. to 1:30 a.m. During the spring and summer months, the shift hours might change to occur from 7 a.m. to 5 p.m., and the night shift could occur from 5 p.m. to 3 a.m. Construction workers would primarily use Calaveras Road between I-680 and Geary Road to access the project work area, although some construction workers destined to staging areas near Borrow Area E would use the segment of Calaveras Road in Milpitas, south of the reservoir, to access the project work area.

Trucks delivering materials from off-site locations would travel between 7 a.m. and 5 p.m., and, on average, would add about 18 vehicle trips (9 inbound and 9 outbound) per hour to Calaveras Road north of the dam during the 2-year period between 2012 and 2013. As noted above, sand and gravel would be imported from off-site commercial sources, with the closest source located about 7 miles north of the dam site, on Calaveras Road at the Sunol quarries. While the Sunol quarry is the closest source, the construction contractor would determine which source it will use, and therefore a portion or all of the truck trips may use I-680 for access. No construction trucks are anticipated to access the project work area via Calaveras Road south of the reservoir, with the exception of equipment to be used at Staging Area 11 and Borrow Area E and equipment required

Table 4.12.2: Daily Construction Vehicles Between Project Work Area and Off-Site Locations

Time Period	Daily Construction Worker Trips ¹			Daily Construction Trucks on Calaveras Road ²				Total Daily Trips
	Day Shift	Night Shift	Total Trips (In and Out)	Filter and Drain	Concrete Aggregate	Misc. Deliveries	Total Trips (In and Out)	
Spring 2011	70	10	160	0	4	2	12	172
Summer and Fall 2011	100	20	240	43	4	2	98	338
Winter 2011	70	20	180	0	4	2	12	192
Spring 2012	70	20	180	0	4	2	12	192
Summer and Fall 2012	100	20	240	0	4	2	12	252
Winter 2012	75	20	190	80	4	2	172	362
Spring, Summer and Fall 2013	130	50	360	80	4	2	172	532
Winter 2013	90	20	220	80	4	2	172	392
Spring, Summer and Fall 2014	140	50	380	0	4	2	12	392
Winter 2014	70	20	180	0	4	2	12	192

Notes:

¹ Two ten-hour construction shifts. Includes inbound and outbound vehicle trips.

² Haul trips that would occur on Calaveras Road between I-680 and Geary Road. Includes inbound and outbound vehicle trips.

Source: URS 2009 CUQ37401-Calaveras Dam Replacement Project Estimated Truck Trips to Project and On-Site, February 6, 2009 memorandum

to construct jetties or other docking facilities and delivery of barges at Borrow Area E if the barge haul route option is selected. With the addition of up to 532 daily project-generated construction vehicles on the segment of Calaveras Road north of the dam, traffic volumes would increase, but would remain at levels less than the carrying capacity of the roadway.

The impact of the additional construction worker vehicles and haul trucks on Calaveras Road between I-680 and Geary Road was quantitatively assessed using the operational analysis methodology in the *Highway Capacity Manual* (Transportation Research Board 2001). Calaveras Road is considered a Class II two-lane highway. Level of service for two-lane highways is defined in terms of percent time-spent-following (PTSF) another vehicle. Table 4.12.3 presents the level of service designation, and the PTSF values for each LOS designation.

Table 4.12.3: LOS Criteria for Two-Lane Class II Highways

Level of Service	Percent Time-Spent-Following
A	< 40
B	>40-55
C	>55-70
D	>70-85
E	>85

Source: Transportation Research Board 2001

Table 4.12.4 presents the a.m. and p.m. peak hour traffic volumes (in both directions), PTSF, and LOS designation for existing conditions, and for conditions with the additional construction worker and construction truck trips on the roadway. The analysis was conducted for the construction phase that would result in the greatest increase in daily trips to and from the site (between spring, summer, and fall 2013), and assumes that the truck trips delivering materials from off-site locations would travel to and from the site between 7 a.m. and 5 p.m. The addition of up to 108 project-generated vehicles during both the a.m. and p.m. peak hours would not substantially affect the existing operating conditions on Calaveras Road, and the operating conditions would remain at acceptable levels. The impacts of short-term increases in traffic volumes on Calaveras Road during construction would be less than significant, although drivers on Calaveras Road would experience intermittent delays, particularly if they were traveling behind a truck.

Table 4.12.4: LOS Operating Conditions on Calaveras Road Between I-680 and Geary Road

Peak Hour ¹	Existing Conditions			Existing with Project Conditions		
	Volume	PTSF ²	LOS	Volume	PTSF	LOS
AM Peak	79	39.3	A	187	50.4	B
PM Peak	103	49.3	B	211	54.9	B
<i>Notes:</i> ¹ On Calaveras Road, the a.m. peak hour is typically between 6 and 7 a.m., and the p.m. peak hour is between 4 and 5 p.m. ² PTSF – Percent Time-Spent-Following						

Source: ETJV 2007

Hauling of materials from off site would occur during weekdays from 7 a.m. to 5 p.m., or may occur at night. The impact of construction truck trips would be less if deliveries of materials occurred during the evening and overnight hours between 5 p.m. and 7 a.m. Traffic volumes on Calaveras Road between I-680 and Geary Road during this 14-hour period are between 30 and 35 percent of the daily traffic volumes, and therefore fewer vehicles would be affected by trucks on Calaveras Road.

Since there are no transit routes on Calaveras Road, project construction activities would not impact any transit operations. Bicycle travel would be most affected on weekdays when Calaveras Road between Geary Road and Felter Road would be closed for a 2-month period in summer 2011 and for an 18-month period starting in winter 2012, if a bicyclist chooses to divert to roadways with greater traffic volumes.

During the a.m. and p.m. peak hours, up to 108 project-generated vehicle trips would also travel on I-680. If the Sunol quarries are used by the construction contractors as sources of sand and gravel, the number of project-generated peak hour vehicle trips on I-680 would be less. In addition to project-generated vehicle trips, the closure of Calaveras Road would result in a diversion of up to 10 vehicles from the closed portion of Calaveras Road to I-680 during the a.m. peak hour and up to 50 vehicles during the p.m. peak hour (see the discussion in Impact 4.12.1, above). The addition of up to 118 vehicles during the a.m. peak hour and up to 158 vehicles during the p.m. peak hour to I-680 would represent a minimal increase in peak hour traffic volumes on I-680 of about 1 percent. Since both directions of I-680 in the vicinity of Calaveras Dam currently operate at acceptable levels of service during the a.m. and p.m. peak periods, the addition of up to 158 project-generated vehicle trips to I-680 would not substantially affect the peak period operating conditions on I-680. Therefore, the traffic impacts related to short-term traffic increases on I-680 would be less than significant.

Impact Conclusion

The traffic impacts associated with short-term increases in traffic on I-680 and Calaveras Road during construction would be less than significant.

Impact 4.12.3: Impaired access to adjacent roadways and land uses for emergency service providers.

Construction activities associated with the dam replacement would be conducted within the established work area, and would not involve construction within the right-of-way of public roadways outside of the work area. Construction vehicle trips associated with construction activities would not substantially affect the LOS operating conditions on Calaveras Road or I-680, and would therefore not impede emergency response vehicles.

Calaveras Road between Geary Road and the dam access road would be used as a haul route. As discussed below, the SFPUC would request permission from Alameda County to close Calaveras Road between a point immediately south of the intersection with Geary Road and a point near the Santa Clara County line (south of the dam access road) for public safety reasons to through-traffic, Monday through Friday except for emergency vehicles, for a 2-month period in summer 2011, and for an approximately 18-month period beginning in winter 2012. In addition, the SFPUC would request permission from Santa Clara County to close the portion of the road between the Alameda County line and Felter Road during the same two periods; the purpose of this additional road closure would be to prevent vehicles that may enter Calaveras Road from the south from needing to turn around at a dead end at the Alameda County line. The closed portion of Calaveras Road would be swept clean on either Friday evening or Saturday morning, and re-opened for traffic on Saturday and Sunday. As part of the encroachment permit process required by Alameda and Santa Clara Counties for temporary closure of Calaveras Road, contractors would be required to provide for emergency vehicle access at all times. Since there currently are no commercial uses on the closed portion of Calaveras Road and the existing watershed keeper's residence located about 1,200 feet south of the existing dam would be vacated during project construction, the potential for emergency response calls to the closed section of Calaveras Road likely would be limited. Therefore, impacts on access for emergency service providers would be less than significant.

Impact Conclusion

The impacts related to inadequate access for emergency service providers would be less than significant.

Impact 4.12.4: Increased potential for traffic safety hazards for vehicles and bicyclists on public roadways during construction.

Construction vehicles delivering materials to the project site would share the area roadways with other vehicles, bicyclists, and pedestrians. The use of Calaveras Road (north of the dam) to access the work area could increase traffic safety hazards due to potential conflicts between construction vehicles (with slower speeds and wider turning radii than autos) and autos, bicyclists, and pedestrians. The increase in traffic safety hazards during construction would be considered a potentially significant impact.

The greatest potential for conflicts between construction vehicles and other vehicles would occur during two periods, for approximately 2 months in summer 2011 and 18 months beginning in winter 2012 on Calaveras Road. During these two periods, haul trucks would use Calaveras Road to deliver sand and gravel to the replacement dam site for use as filter and drain material. As discussed in the Setting section above, the portion of Calaveras Road between Geary Road and Felter Road (west and south of the dam) is a one-lane, winding mountain roadway serving the Sunol Wilderness Regional Preserve and Calaveras Reservoir and Dam. Haul trucks travelling on this section of Calaveras Road to deliver sand and gravel to the replacement dam site could create a hazard to motorists, bicyclists, and pedestrians. During all these periods hauling of materials from off site would occur during weekdays from 7 a.m. to 5 p.m., or may occur at night. If at night, hauling would likely occur between 5 p.m. and 7 a.m., Monday through Friday. The potential for conflicts on Calaveras Road would be somewhat reduced if deliveries of filter and drain materials (the bulk of the construction vehicles using Calaveras Road north of Geary Road) were to occur during the evening and overnight hours. Since traffic volumes on Calaveras Road between I-680 and Geary Road during this 14-hour period are between 30 and 35 percent of the daily traffic volumes, the potential for conflicts with other vehicles, as well as with pedestrians and bicyclists, would be less. However, traffic safety issues related to nighttime hauling, including visibility of the roadway and surrounding terrain, and glare from artificial light sources, would increase traffic safety hazards during the overnight hours. The increase in traffic safety hazards during the overnight hours would be considered a potentially significant impact.

To avoid the potential traffic safety hazards during construction identified above, Mitigation Measure 5.12.4a requires the SFPUC or its contractors to prepare and implement a Traffic Control Plan. The Traffic Control Plan would include provisions such as installation of signs warning motorists, bicyclists, and pedestrians of the construction zone, notification of detour routes for vehicles and alternate bicycle routes, and use of flaggers, illuminated signs, temporary stoplights, flashing yellow lights, or a combination of these methods to slow approaching traffic at project site access points to reduce traffic hazards during construction. In addition, Mitigation Measure 5.12.4b requires the SFPUC to seek approval from Alameda County to close Calaveras Road from Geary Road to the dam site to through traffic Monday through Friday except for emergency vehicles for a 2-month period in summer 2011, and for an approximately 18-month

period beginning in winter 2012. During the same period, SFPUC would be required to seek approval from Santa Clara County to either (1) close Calaveras Road between the dam access road and Felter Road to through traffic Monday to Friday, except for emergency vehicles, to avoid creating a 7-mile long dead-end with no outlet; or (2) construct a turnaround at the dam site and installing signage at Felter Road advising of no outlet 7-miles up the road due to construction. The closed portion of Calaveras Road would be swept clean on either Friday evening or Saturday morning, and re-opened for traffic on Saturday and Sunday. Implementation of Mitigation Measures 5.12.4a and 5.12.4b would reduce the traffic safety impacts during project construction to a less than significant level. However, because closure of Calaveras Road is subject to the approval of Santa Clara and Alameda Counties, implementation of Mitigation Measure 5.12.4b is not fully within the control of the SFPUC. If Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site as specified in Mitigation Measure 5.12.4b, the traffic hazards during construction would not be fully mitigated. Therefore, this impact is potentially significant and unavoidable.

Impact Conclusion

Construction-related traffic on Calaveras Road would have a significant traffic safety impact on motorists, bicyclists, and pedestrians. Implementation of a Traffic Control Plan in accordance with Mitigation Measure 5.12.4a and temporary closure of a portion of Calaveras Road under Mitigation Measure 5.12.4b would reduce this impact to a less than significant level. However, if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site, implementation of this provision of Mitigation Measure 5.12.4b would not be feasible. Therefore, the impact of the CDRP on traffic safety hazards during project construction is potentially significant and unavoidable.

Impact 4.12.5: Increased wear and tear on the designated haul routes used by construction vehicles.

I-680 and major arterials are designed to handle a mix of vehicle types, including heavy trucks, and impacts are expected to be negligible on these roads. Calaveras Road (north of the dam) can accommodate heavy trucks (trucks associated with the existing aggregate operations have been using the roadway for many years), and its pavement is in good condition. No improvements are planned for Calaveras Road prior to construction. Calaveras Road between I-680 and Geary Road would be used by construction workers and trucks delivering materials to the work area. It is not anticipated that Calaveras Road would be used as a haul route within the work area, and instead new roadways would be constructed. Table 3.5 (Chapter 3, Project Description) lists the existing and new roadways that would be used by project construction activities. Some construction-related travel, such as construction workers in automobiles traveling between the dam construction area and Staging Area 11, may use Calaveras Road for part of their trip rather than the west haul road used by trucks.

The use of large trucks to transport equipment and materials to the work area could affect road conditions on haul routes in the vicinity of the project, including Calaveras Road, by increasing the rate of road wear and damaging the roadway. This would be considered a potentially significant impact.

Impact Conclusion

Mitigation Measure 5.12.4a would reduce excessive wear and tear impacts on public roadways, including Calaveras Road, to a less-than-significant level (see Section 5.12, Transportation Mitigation Measures) by requiring repair of any segments of these roadways damaged by construction activities to a structural condition equal to that which existed prior to construction activities.

Operational Impacts

Impact 4.12.6: Long-term traffic associated with operation and maintenance of the replacement dam.

The new dam would require periodic operations review and maintenance, similar to existing operations, and would not generate a significant number of new vehicle trips. Overall, any increases in traffic generated by operation and maintenance of the replacement dam would be insignificant, and would not result in a noticeable increase in traffic on adjacent streets.

Impact Conclusion

Long-term operational impacts of the project would be less than significant.

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4. Environmental Setting and Impacts
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4.13 AIR QUALITY

Section 4.13 Contents	
4.13.1 Setting	4.13.2 Impacts
4.13.1.1 Environmental Background	4.13.2.1 Significance Criteria
4.13.1.2 Regulatory Framework	4.13.2.2 Approach to Analysis
	4.13.2.3 Project Impacts

This section summarizes applicable regulations and existing air quality conditions and analyzes potential temporary, short-term, and long-term air quality impacts of the proposed project. The analysis method for temporary and short-term construction, long-term regional (operational), local mobile source, odor, and toxic air contaminant (TAC) emissions is consistent with the recommendations of the Bay Area Air Quality Management District (BAAQMD). Information regarding naturally occurring asbestos (NOA) and naturally occurring metals-containing materials at the project site is presented in Section 4.9, Hazards and Hazardous Materials.

4.13.1 SETTING

4.13.1.1 ENVIRONMENTAL BACKGROUND

Subsection 4.13.1.1 Contents

Topography, Meteorology, and Climate
 Existing Air Quality Conditions
 Ozone
 Carbon Monoxide
 Nitrogen Dioxide
 Sulfur Dioxide
 Particulate Matter
 Lead
 Emissions Inventory
 Monitoring Station Data and Attainment Area Designations
 Toxic Air Contaminants
 Diesel Particulate Matter
 Naturally Occurring Asbestos
 Odors
 Greenhouse Gases
 Greenhouse Gases as Global Pollutants
 Emissions Sources and Inventory

The project area is located in Alameda County and Santa Clara County, which are within the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB also comprises all of Contra Costa, Marin, Napa, San Francisco, and San Mateo Counties, the southern half of Sonoma County, and the southwestern portion of Solano County.

Ambient concentrations of air pollutant emissions are determined by the amount of pollutant released by emissions sources and the atmosphere's ability to transport and dilute these emissions. Natural factors that affect pollutant transport and dilution include terrain, wind, atmospheric stability, and the presence of sunlight. Therefore, existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of pollutant released by existing air emissions sources, as discussed separately below.

Topography, Meteorology, and Climate

The SFBAAB covers approximately 5,540 square miles of complex terrain consisting of coastal mountain ranges, inland valleys, and the San Francisco Bay. The SFBAAB is generally bounded on the west by the Pacific Ocean, on the north by the Coast Ranges, and on the east and south by the Diablo Range.

The climate is dominated by a strong, semi-permanent, subtropical high-pressure cell over the northeastern Pacific Ocean. Climate is also affected by the moderating effects of the adjacent oceanic heat reservoir. Mild summers and winters, moderate rainfall and humidity, and daytime onshore breezes characterize Bay Area regional climatic conditions. In summer, when the high-pressure cell is strongest and farthest north, fog forms in the morning, and temperatures are mild. In winter, when the high-pressure cell is weakest and farthest south, occasional rainstorms occur.

Regional flow patterns affect air quality patterns by directing pollutants downwind of sources. Localized meteorological conditions, such as moderate winds, disperse pollutants and reduce pollutant concentrations. When a warm layer of air traps cooler air close to the ground, an inversion is produced that traps air pollutants near the ground. Inversions occur in the project area during summer mornings and afternoons. During summer's long daylight hours, plentiful sunshine fuels photochemical reactions between nitrogen oxides (NO_x) and reactive organic gases (ROG) that result in ozone formation.

In the winter, temperature inversions dominate during the night and early morning hours but frequently dissipate by afternoon. At night during the winter, the greatest pollution problems are from carbon monoxide (CO) and NO_x. High CO concentrations occur on winter days with strong surface inversions and light winds, which result in extremely limited CO transport.

Existing Air Quality Conditions

Concentrations of the air pollutants ozone, CO, nitrogen dioxide (NO₂), sulfur dioxide (SO₂), respirable and fine particulate matter (PM₁₀, PM_{2.5}), and lead are used as indicators of ambient air quality conditions. Because these are the most prevalent air pollutants known to be deleterious to human health and extensive health-effects criteria documents are available, they are commonly referred to as "criteria air pollutants." Each pollutant is described briefly below, including source

types, health effects, and future trends along with the most current attainment area designations and monitoring data for the project area.

Portions of the project area are located within a geologic formation known to contain sources of NOA. Existing background air concentrations of NOA are expected in the vicinity of the project site. A discussion of existing conditions and provisions proposed to address the potential presence of NOA and metals in fugitive dust is presented in Section 4.9, Hazards and Hazardous Materials, of this Environmental Impact Report (EIR).

Ozone

Ozone is the primary component of smog and a photochemical oxidant, which is a substance produced when oxygen combines chemically with another substance in the presence of sunlight. Ozone is not directly emitted into the air but is formed through complex chemical reactions between precursor emissions of ROG and NO_x in the presence of sunlight. ROG are photochemically reactive volatile organic compounds and are emitted primarily from incomplete combustion and evaporation of chemical solvents and fuels. NO_x are gaseous compounds of nitrogen and oxygen that result from the combustion of fuels in air (because of the reaction between oxygen and nitrogen from the air). Ozone located in the upper atmosphere (stratosphere) acts beneficially to shield the earth from harmful ultraviolet radiation emitted by the sun. However, ozone located in the lower atmosphere (troposphere) is a major health and environmental concern. Meteorology and terrain play a major role in ozone formation. Generally, low wind speeds or stagnant air coupled with warm temperatures and clear skies provide optimum conditions for ozone formation. As a result, summer is generally the peak ozone season. Because of the reaction time involved in forming ozone, peak concentrations are often found far downwind of the precursor emissions. Therefore, ozone is a regional pollutant that often affects large areas. In general, ozone concentrations over or near urban and rural areas reflect an interplay of emissions of ozone precursors, transport, meteorology, and atmospheric chemistry (Godish 1991).

The adverse health effects of ozone exposure primarily arise in the respiratory system. Scientific evidence indicates that ambient levels of ozone affect not only sensitive receptors, such as asthmatics and children, but healthy adults as well. Exposure to ambient levels of ozone ranging from 0.10 to 0.40 parts per million (ppm) for 1–2 hours has been found to significantly alter lung function by increasing respiratory rates and pulmonary resistance, decreasing tidal volumes, and impairing respiratory mechanics. Ambient ozone levels above 0.12 ppm are linked to symptomatic responses that include throat dryness, chest tightness, headache, and nausea. In addition, ozone exposure may damage lung membranes, damage respiratory system functions, and interfere with or inhibit the immune system's ability to defend against infection (Godish 1991).

Emissions of the ozone precursors ROG and NO_x from both mobile (vehicle) and stationary sources have decreased in the SFBAAB since 1975 and are projected to continue declining through 2020. Reasons include the implementation of strict motor vehicle emissions controls, new controls on oil refinery fugitive emissions, and new rules for control of ROG from industrial coatings and solvent operations (CARB 2006a).

Carbon Monoxide

CO is a colorless, odorless, poisonous gas produced by incomplete burning of carbon in fuels, primarily from mobile (transportation) sources. Nationwide, 77 percent of CO emissions are from mobile sources. The other 23 percent are from wood-burning stoves, incinerators, and industrial sources.

CO enters the bloodstream through the lungs and combines irreversibly with hemoglobin, which normally supplies oxygen to the cells; this drastically reduces the amount of oxygen available to cells. Adverse health effects associated with CO exposure include dizziness, headaches, and fatigue. CO exposure is especially harmful to individuals who suffer from cardiovascular and respiratory diseases (USEPA 2006a).

The highest CO concentrations are generally associated with cold, stagnant winter weather conditions. In contrast to ozone problems, which tend to be regional, CO problems tend to be localized.

Nitrogen Dioxide

NO₂ is a brownish, highly reactive gas that is present in all urban environments. The major human-made NO₂ sources are combustion devices, such as boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines (e.g., typical automobile and gas lawn mower engines). Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO₂ (USEPA 2006a). The combined emissions of NO and NO₂ are referred to as NO_x and reported as equivalent NO₂. Because NO₂ is formed and depleted by reactions associated with photochemical smog (ozone), the NO₂ concentration in a particular geographical area may not be representative of the local NO_x emission sources.

Inhalation is the most common NO₂ exposure route. The severity of adverse health effects depends primarily on the concentration inhaled rather than the duration of exposure. An individual may experience a variety of acute symptoms, including coughing, difficulty breathing, vomiting, headache, and eye irritation during or shortly after exposure. After approximately 4 to 12 hours, an exposed individual may experience pneumonia-like problems: fluid build-up in the lungs, breathing abnormalities, cough, bluish skin discoloration, chest pain, and rapid heartbeat.

Severe, symptomatic NO₂ intoxication after acute exposure has been linked on occasion with prolonged respiratory impairment, including chronic bronchitis and decreased lung function.

Sulfur Dioxide

SO₂ is produced by stationary sources such as facilities where coal and oil are combusted, steel mills, refineries, and pulp and paper mills. The upper respiratory tract is the major site of adverse health effects from SO₂ exposure. SO₂ is a respiratory irritant, producing sulfurous acid, a direct irritant, on contact with moist mucus membranes. Bronchioles constrict with inhalation of 5 ppm or more. Concentration rather than duration of the exposure is an important determinant of respiratory effects. Exposure to high SO₂ concentrations may result in edema of the lungs or glottis (part of the vocal chords) and respiratory paralysis.

Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers (µm) or smaller is referred to as PM₁₀. PM₁₀ consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires and natural windblown dust, and particulate matter formed in the atmosphere by condensation and/or transformation of SO₂ and ROG (USEPA 2006a). PM_{2.5} is a subgroup of smaller particles that have an aerodynamic diameter of 2.5 µm or smaller (CARB 2006a).

The adverse health effects associated with PM₁₀ depend on its specific composition. For example, health effects may be associated with metals, polycyclic aromatic hydrocarbons, and other toxic substances adsorbed onto fine particulate matter (referred to as the “piggybacking effect”), or with fine dust particles of silica or asbestos (more information about the presence of naturally occurring asbestos [NOA] in serpentine rock on the project site is presented below, as well as in Section 4.9, Hazards and Hazardous Materials). Generally, adverse health effects associated with PM₁₀ may result from both short-term and long-term exposure to elevated concentrations and may include breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, immune system alterations, carcinogenesis, and premature death (USEPA 2006a). PM_{2.5} poses an increased health risk because the particles can deposit deep in the lungs and may contain substances that are particularly harmful to human health. Direct emissions of PM₁₀ increased in the SFBAAB between 1975 and 2005 and are projected to continue increasing through 2020. This increase results from growth in emissions, primarily fugitive dust, from areawide sources. Because of stringent emissions standards, direct emissions of PM₁₀ from diesel motor vehicles have been decreasing since 1990 even though population and vehicle miles traveled (VMT) are growing (CARB 2006a).

Lead

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial. As a result of the phase-out of leaded gasoline, discussed below, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, the U.S. Environmental Protection Agency (USEPA) set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The USEPA banned the use of leaded gasoline in highway vehicles in December 1995 (USEPA 2006a).

As a result of the USEPA's regulatory efforts to remove lead from gasoline, lead emissions by the transportation sector have declined dramatically (95 percent between 1980 and 1999), and levels of lead in the air decreased by 94 percent between 1980 and 1999. Transportation sources, primarily airplanes, now contribute only 13 percent of lead emissions. A National Health and Nutrition Examination Survey reported a 78 percent decrease in the levels of lead in people's blood between 1976 and 1991. This dramatic decline can be attributed to the move from leaded to unleaded gasoline (USEPA 2006a).

The decrease in lead emissions and ambient lead concentrations during the past 25 years is California's most dramatic air quality management success story. Phase-out of lead in gasoline began during the 1970s, and subsequent California Air Resources Board (CARB) regulations have virtually eliminated all lead from gasoline now sold in California. All parts of the state are currently designated as attainment areas for the state lead standard (the USEPA does not designate attainment and non-attainment areas for the national lead standard). (Attainment and non-attainment are explained below in the "Monitoring Station Data and Attainment Area Designations" subsection.)

However, lead emissions from stationary sources still pose "hot spot" problems in some areas. As a result, the CARB has identified lead as a TAC.

Emissions Inventory

Table 4.13.1 summarizes emissions of criteria air pollutants within the SFBAAB for various source categories. According to the emissions inventory for the SFBAAB, mobile sources are the largest contributors to the estimated annual average air pollutant levels, accounting for approximately 49 percent of total ROG, 88 percent of total CO, and 85 percent of total NO_x.

Table 4.13.1: Summary of 2008 Emissions Inventory for the San Francisco Bay Area Air Basin

Source Type / Category	Estimated Annual Average Emissions (tons per day)					
	ROG	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}
Stationary Sources						
Fuel Combustion	3.2	40.1	45.3	12.1	5.4	5.4
Waste Disposal	36.0	1.9	0.6	0.2	0.1	0.1
Cleaning and Surface Coating	34.9	0.0	0.0	–	0.0	–
Petroleum Production and Marketing	21.4	0.3	0.6	25.6	1.0	0.9
Industrial Processes	11.1	1.9	4.1	8.1	9.8	5.8
Subtotal	106.6	44.3	50.6	45.9	16.3	12.1
Areawide Sources						
Solvent Evaporation	71.5	–	–	–	–	–
Miscellaneous Processes	16.5	161.9	16.9	0.6	175.5	52.9
Subtotal	87.9	161.9	16.9	0.6	175.5	52.9
Mobile Sources						
On-road Motor Vehicles	112.3	1,066.7	206.7	0.9	10.1	7.1
Other Mobile Sources	70.8	474.8	173.8	14.0	10.2	9.1
Subtotal	183.1	1541.5	380.5	14.9	20.3	16.3
Grand Total for SFBAAB	377.6	1747.7	448.0	61.5	212.1	81.3
<i>Notes:</i> CO = carbon monoxide; NO _x = nitrogen oxides; PM _{2.5} = fine particulate matter; PM ₁₀ = respirable particulate matter; ROG = reactive organic gases; SFBAAB = San Francisco Bay Area Air Basin; SO _x = oxides of sulfur.						

Source: Taken directly from CARB 2009a

Monitoring Station Data and Attainment Area Designations

Criteria air pollutant concentrations are measured at several monitoring stations in the SFBAAB. The Fremont–Chapel Way station (located at 40733 Chapel Way in Fremont) is the closest Alameda County monitoring station to the project site that has recent data for ozone, NO₂, CO, PM₁₀, and PM_{2.5}; similarly, the San Jose–Jackson Street station (located at 158 Jackson Street in San Jose) is the closest Santa Clara County monitoring station to the project site that has recent data for these pollutants. In general, ambient air quality measurements from these stations are representative of the air quality in the project area. Table 4.13.2 summarizes the air quality data at these stations from the most recent 3 years.

Table 4.13.2: Summary of Annual Ambient Air Quality Data in the Project Area (2006–2008)¹

Station / Criteria Air Pollutant	2006	2007	2008
Chapel Way Station, Fremont			
Ozone			
Maximum concentration (1-hr/8-hr, ppm)	0.102/0.074	0.079/0.068	0.112/0.078
Number of days state standard exceeded (1-hr)	4	0	1
Number of days national standard exceeded (1-hr/8-hr)	0/0	0/0	0/1
Nitrogen Dioxide (NO₂)			
Maximum concentration (1-hr, ppm)	0.063	0.058	0.062
Number of days state standard exceeded (1-hr)	0	0	0
Annual Average (ppm)	0.015	0.014	0.014
Carbon Monoxide (CO)			
Maximum concentration (8-hr, ppm)	1.81	1.57	1.43
Number of days state/national standard exceeded (8-hr)	0/0	0/0	0/0
Respirable Particulate Matter (PM₁₀)			
Maximum concentration (µg/m ³)	56.6	60.6	38.7
Number of days state standard exceeded (calculated ²)	4.4	6.0	—
Number of days national standard exceeded (calculated ²)	0	0	—
Fine Particulate Matter (PM_{2.5})			
Maximum concentration (µg/m ³)	43.9	51.2	28.6
Number of days national standard exceeded (measured ²)	2	2	0
Jackson Street Station, San Jose			
Ozone			
Maximum concentration (1-hr/8-hr, ppm)	0.118/0.087	0.083/0.068	0.118/0.080
Number of days state standard exceeded (1-hr)	5	0	1
Number of days national standard exceeded (1-hr/8-hr)	0/3	0/0	0/2
<i>Notes:</i> ppm = parts per million; µg/m³ = micrograms per cubic meter. ¹ Data from the Fremont–Chapel Way station (located at 40733 Chapel Way in Fremont) in Alameda County and from the San Jose–Jackson Street Station (located at 158 Jackson Street in San Jose) in Santa Clara County. ² Measured days are days on which an actual measurement was greater than the national or state daily standard. Measurements are typically collected every 6 days. Calculated days are the estimated number of days on which a measurement would have been greater than the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.			

Source: CARB 2009b

Both the CARB and USEPA use these types of monitoring data to designate areas according to attainment status for criteria air pollutants identified by the agencies. The purpose of these designations is to identify areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are “non-attainment,” “attainment,” and “unclassified.” “Unclassified” is used when an area cannot be designated, on the basis of available information, as meeting or not meeting the standards. The California designations include a subcategory of the non-attainment designation, called “non-attainment-transitional,” for non-attainment areas that are progressing and nearing attainment. Table 4.13.3 shows the most current attainment status for each criterion air pollutant in the project area. The region is a non-attainment area for ozone, PM₁₀, and PM_{2.5}.

Toxic Air Contaminants

TAC concentrations are used as indicators of ambient-air-quality conditions. According to the *California Almanac of Emissions and Air Quality* (CARB 2006a), the majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being diesel particulate matter (diesel PM). In addition to diesel PM, the TACs for which data are available that pose the greatest existing ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene.

Diesel Particulate Matter

Diesel PM differs from other TACs in that it is not a single substance but a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether the vehicle has an emission control system.

Unlike for other TACs, no ambient monitoring data are available for diesel PM because no routine measurement method currently exists. However, the CARB has made preliminary concentration estimates based on a PM exposure method. This method uses the CARB emissions inventory's PM₁₀ database, ambient PM₁₀ monitoring data, and the results from several studies to estimate diesel PM concentrations.

Diesel PM poses the greatest health risk among the 10 TACs that pose the greatest existing ambient risk in California. Based on receptor modeling techniques, the CARB estimated the background diesel PM health risk in the SFBAAB in 2000 to be 480 cancer cases per million people (CARB 2006a). Since 1990, the health risk of diesel PM in the SFBAAB has been reduced by 50 percent. Overall in the SFBAAB, levels of most TACs, except for para-dichlorobenzene and formaldehyde, have gone down since 1990 (CARB 2006a).

Table 4.13.3: Ambient Air Quality Standards and San Francisco Bay Area Air Basin Attainment Status

Pollutant	Averaging Time	California		National ¹		
		Standards ^{2,3}	Attainment Status (Alameda and Santa Clara Counties) ⁴	Primary ^{3,5}	Secondary ^{3,6}	Attainment Status(Alameda/ Santa Clara Counties) ⁷
Ozone	1-hour	0.09 ppm (180 µg/m ³)	N (Serious)	– ⁹	–	–
	8-hour	0.07 ppm ⁸ (137 µg/m ³)	–	0.08 ppm (157 µg/m ³)	Same as Primary Standard	N (Marginal)
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m ³)	A	35 ppm (40 mg/m ³)	–	U/A
	8-hour	9 ppm (10 mg/m ³)		9 ppm (10 mg/m ³)		
Nitrogen Dioxide (NO ₂)	Annual Arithmetic Mean	–	–	0.053 ppm (100 µg/m ³)	Same as Primary Standard	U/A
	1-hour	0.25 ppm (470 µg/m ³)	A	–		
Sulfur Dioxide (SO ₂)	Annual Arithmetic Mean	–	–	0.030 ppm (80 µg/m ³)	–	A
	24-hour	0.04 ppm (105 µg/m ³)	A	0.14 ppm (365 µg/m ³)	–	
	3-hour	–	–	–	0.5 ppm (1,300 µg/m ³)	
	1-hour	0.25 ppm (655 µg/m ³)	A	–	–	
Respirable Particulate Matter (PM ₁₀)	Annual Arithmetic Mean	20 µg/m ³	N	– ¹²	Same as Primary Standard	U
	24-hour	50 µg/m ³		150 µg/m ³		

(continued)

Table 4.13.3 (continued)

Pollutant	Averaging Time	California		National ¹		
		Standards ^{2,3}	Attainment Status (Alameda and Santa Clara Counties) ⁴	Primary ^{3,5}	Secondary ^{3,6}	Attainment Status (Alameda/ Santa Clara Counties) ⁷
Fine Particulate Matter (PM _{2.5})	Annual Arithmetic Mean	12 µg/m ³	N	15 µg/m ³	Same as Primary Standard	U/A
	24-hour	–	–	65 µg/m ³		
Lead ¹⁰	30-day Average	1.5 µg/m ³	A	–	–	–
	Calendar Quarter	–	–	1.5 µg/m ³	Same as Primary Standard	U/A
Sulfates	24-hour	25 µg/m ³	A	No National Standards		
Hydrogen Sulfide ¹⁰	1-hour	0.03 ppm (42 µg/m ³)	U			
Vinyl Chloride ¹¹	24-hour	0.01 ppm (26 µg/m ³)	U/A			
Visibility-Reducing Particulate Matter	8-hour	Extinction coefficient of 0.23 per kilometer – visibility of 10 miles or more (0.07 – 30 miles or more for Lake Tahoe) because of particles when the relative humidity is less than 70 percent.	U			

(continued)

Table 4.13.3 (continued)

Notes:

- ¹ National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM₁₀ 24-hour standard is attained when 99 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The PM_{2.5} 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.
- ² California standards for ozone, CO (except Lake Tahoe), SO₂ (1- and 24-hour), NO₂, PM, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California Ambient Air Quality Standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.
- ³ Concentration expressed first in units in which standard was promulgated (i.e., parts per million [ppm] or micrograms per cubic meter [$\mu\text{g}/\text{m}^3$]). Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; "ppm" in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.
- ⁴ Unclassified (U): A pollutant is designated "unclassified" if the data are incomplete and do not support a designation of attainment or non-attainment.
- Attainment (A): A pollutant is designated "attainment" if the state standard for that pollutant was not violated at any site in the area during a 3-year period.
- Non-attainment (N): A pollutant is designated "non-attainment" if there was a least one violation of a state standard for that pollutant in the area.
- Non-attainment/Transitional (NT): A subcategory of the "non-attainment" designation. An area is designated "non-attainment/transitional" to signify that the area is close to attaining the standard for that pollutant.
- ⁵ National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect public health.
- ⁶ National Secondary Standards: The levels of air quality necessary to protect public welfare from any known or anticipated adverse effects of a pollutant.
- ⁷ Non-attainment (N): Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
- Attainment (A): Any area that meets the national primary or secondary ambient air quality standard for the pollutant.
- Unclassifiable (U): Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.
- ⁸ This concentration became effective May 17, 2006.
- ⁹ The 1-hour ozone National Ambient Air Quality Standard was revoked on June 15, 2005.
- ¹⁰ The CARB has identified lead and vinyl chloride as TACs with no threshold of exposure determined for adverse health effects. This allows for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
- ¹¹ Refer to Section 4.9, Hazards and Hazardous Materials, for information on gassy conditions, including hydrogen sulfide and methane.
- ¹² Because of lack of evidence linking health problems to long-term coarse particle pollution exposure, the USEPA revoked the annual PM₁₀ standard on September 21, 2006.

Sources: CARB 2006b, CARB 2006c, USEPA 2006b

Naturally Occurring Asbestos

Asbestos is the common name for a group of naturally occurring fibrous silicate minerals that can separate into thin but strong and durable fibers. NOA, which the CARB identified as a TAC in 1986, is found in many parts of California and commonly associated with serpentine rock (serpentine).

As discussed in Section 4.8, Geology, Soils, and Seismicity, Franciscan Serpentine and Mélange are rock types known to contain small amounts of chrysotile asbestos. These rocks are mapped within the Calaveras fault zone, on the western side of Observation Hill, beneath the Calaveras Creek channel downstream of the existing dam, at the right abutment of the existing dam, and on the hillside to the east (URS 2005, Figures 4A–4D). Chrysotile is a NOA mineral that can be a human health hazard if it becomes airborne. The other serpentine minerals found in serpentine do not form fibrous crystals and are not asbestos minerals.

The source of the fill materials historically used in the construction of the existing dam is not well described. However, a large portion of the fill was obtained from the quarry on the southwest face of Observation Hill (Elliot 1916) in an area mapped as Franciscan Complex Mélange and Franciscan Complex Serpentine (URS 2005, Figures 4A–4D). In addition, some fill was probably obtained from materials in the vicinity of the right dam abutment where mélange is mapped. Thus, rocks containing NOA are probably present in the earth and rockfill of the existing dam.

Exposure to airborne asbestos poses a potential health hazard. The issues related to NOA and naturally occurring metals-containing materials at the project site are addressed in Section 4.9, Hazards and Hazardous Materials.

Odors

Typically, odors are regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

With respect to odors, the human nose is the sole sensing device. The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to specific odors. In addition, people may have different reactions to the same odor; an odor that is offensive to one person (e.g., from a fast-food restaurant) may be perfectly acceptable to another. An unfamiliar odor is more easily detected and more likely to cause complaints than a familiar one because of the phenomenon known as

“odor fatigue,” in which a person can become desensitized to almost any odor so that recognition occurs only with an alteration in the intensity.

Quality and intensity are two properties of any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as “flowery” or “sweet,” the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word “strong” to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases, and the odor intensity weakens and eventually becomes so low that detection or recognition is difficult. At some point during dilution, the concentration of the odorant falls below a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Greenhouse Gases

Various gases in the earth’s atmosphere classified as greenhouse gases (GHGs) play a critical role in determining the earth’s surface temperature. Solar radiation enters the earth’s atmosphere from space. A portion of the radiation is absorbed by the earth’s surface, and a smaller portion of this radiation is reflected back toward space. The absorbed radiation is then emitted from the earth, not as high-frequency solar radiation but as lower-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower-frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead “trapped” and warms the atmosphere. This phenomenon, known as the Greenhouse Effect, is responsible for maintaining a habitable climate on earth. Without the Greenhouse Effect, earth would not be able to support life as we know it.

Prominent GHGs contributing to the Greenhouse Effect are carbon dioxide (CO₂), methane (CH₄), ozone, nitrous oxide (N₂O), hydrofluorocarbons, chlorofluorocarbons, and sulfur hexafluoride. Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the Greenhouse Effect and have led to an unnatural warming trend in the earth’s climate, known as global climate change or global warming (Ahrens 2003). It is extremely unlikely that the global climate change of the past 50 years can be explained without the contribution from human activities (IPCC 2007).

Greenhouse Gases as Global Pollutants

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants and TACs, which are pollutants of regional and local concern. Whereas pollutants with localized

air quality effects have relatively short atmospheric lifetimes (about 1 day), GHGs have long atmospheric lifetimes (1 year to several thousand years) and persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the exact lifetime of any particular GHG molecule is dependent on multiple variables and cannot be pinpointed, it is understood that more CO₂ is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO₂ emissions, approximately 54 percent is sequestered within a year through ocean uptake, uptake by northern hemisphere forest regrowth, and other terrestrial sinks; the remaining 46 percent of human-caused CO₂ emissions remain stored in the atmosphere (Seinfeld and Pandis 1998).

Similarly, GHG impacts are borne globally, but air quality effects of criteria air pollutants and TACs are felt locally. The quantity of GHG that it takes to ultimately result in climate change is not precisely known but is enormous, and no single project alone would be expected to measurably contribute to a noticeable incremental change in the global average temperature, or to the global, local, or microclimate.

Emissions Sources and Inventory

GHG emissions contributing to global climate change are attributable in large part to human activities in the industrial/manufacturing, utility, transportation, residential, and agricultural sectors (CEC 2006). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (CEC 2006). CO₂ emissions are byproducts of fossil fuel combustion. CH₄, a highly potent GHG, results from off-gassing (the release of chemicals from non-metallic substances under ambient or greater pressure conditions) that is largely associated with agricultural practices and landfills. CO₂ sinks or reservoirs include vegetation and the ocean, which absorb CO₂ through sequestration and dissolution, respectively; these are two of the most common CO₂ sequestration processes.

California is the 12th to 16th largest emitter of CO₂ in the world (CEC 2006), producing 499 million gross metric tons of CO₂ equivalent (CO₂e) in 2004. CO₂e is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the Greenhouse Effect. This potential, known as the global warming potential of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, as described in Appendix C, Calculation References, of the General Reporting Protocol of the California Climate Action Registry (CCAR) (CCAR 2007), 1 ton of CH₄ contributes the same to the Greenhouse Effect as approximately 23 tons of CO₂. In other words, CH₄ is a much more potent GHG than CO₂. Expressing emissions in CO₂e takes the contributions of all GHG emissions to the Greenhouse Effect and converts them to a single unit equivalent to the effect that would occur if only CO₂ were being emitted.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 41 percent of total state GHG emissions (CEC 2006). Transportation was followed by the electric power sector (including both in-state and out-of-state sources) (22.2 percent), and the industrial sector (20.5 percent) (CEC 2006).

According to the source inventory of GHG emissions in the SFBAAB, 103 million tons of CO₂e were emitted in the SFBAAB in 2007 (BAAQMD 2008). Transportation sources (e.g., fossil fuel combustion) were associated with 41 percent of the total emissions, industrial/commercial 34 percent, domestic 7 percent, power plants 15 percent, and off-road equipment 3 percent. Alameda and Santa Clara counties accounted for 17 percent and 18 percent, respectively, of the SFBAAB's total GHG emissions inventory in 2007 (CARB 2007).

4.13.1.2 REGULATORY FRAMEWORK

Subsection 4.13.1.2 Contents

- Federal Regulations
- State Regulations
- Local and Regional Regulations
- Toxic Air Contaminants
 - Federal Hazardous Air Pollutant Programs
 - State and Local Toxic Air Contaminant Programs
- Regulation of Odors
- Greenhouse Gas Emissions
 - Federal Provisions
 - State Provisions
 - Local and Regional Provisions

Air quality within Alameda and Santa Clara counties is regulated by the USEPA, CARB, and BAAQMD. Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although USEPA regulations may not be superseded, both state and local regulations may be more stringent.

Air quality regulations focus on the following air pollutants: ozone, CO, NO₂, SO₂, PM₁₀ and PM_{2.5}, and lead.

Federal Regulations

At the federal level, the USEPA has been charged with implementing national air quality programs. The USEPA's air quality mandates are drawn primarily from the federal Clean Air Act (CAA), enacted in 1970. The most recent major CAA amendments were made by Congress in 1990.

The CAA required the USEPA to establish national ambient air quality standards (NAAQS). As shown in Table 4.13.3, the USEPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, CO, NO₂, SO₂, PM₁₀, PM_{2.5}, and lead. The primary standards protect the public health, and the secondary standards protect public welfare. The CAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with non-attainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. The USEPA must review all SIPs to determine whether they conform to the mandates of the CAA and its amendments and to determine whether implementing the SIPs will achieve air quality goals. If the USEPA determines a SIP to be inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the non-attainment area. Failure to submit an approvable SIP or to implement the plan within the mandated time frame may result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

The project must comply with all required elements of the CAA and regulatory requirements of the USEPA.

State Regulations

The CARB is the agency responsible for coordinating and overseeing state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required the CARB to establish California ambient air quality standards (CAAQS) (Table 4.13.3). The CARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the previously mentioned criteria air pollutants. In most cases the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of those studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts should focus particular attention on reducing emissions from transportation and areawide emission sources and gives districts the authority to regulate indirect sources.

Among the CARB's other responsibilities are overseeing local air district compliance with California and federal laws, approving local air quality plans, submitting SIPs to the USEPA, monitoring air quality, determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

The project must comply with the CCAA, CAAQS, SIP, and any additional CARB requirements.

Local and Regional Regulations

The BAAQMD seeks to improve air quality conditions in Alameda and Santa Clara counties through a comprehensive program of planning, regulation, enforcement, technical innovation, and promoting understanding of air quality issues. The BAAQMD's clean air strategy includes preparing plans and programs for the attainment of ambient air quality standards, adopting and enforcing rules and regulations, and issuing permits for stationary sources. The BAAQMD also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the CAA, CAAA, and CCAA. The project must comply with all applicable regulations and thresholds established by the BAAQMD.

In 1999, the BAAQMD released *BAAQMD CEQA Guidelines* (BAAQMD 1999), an updated advisory document for lead agencies, consultants, and project applicants regarding uniform procedures for addressing air quality in California Environmental Quality Act (CEQA) documents. The *BAAQMD CEQA Guidelines* contain the following applicable elements:

- Criteria and thresholds for determining whether a project may have a significant adverse air quality impact;
- Specific procedures and modeling protocols for quantifying and analyzing air quality impacts;
- Methods available to mitigate air quality impacts; and
- Information for use in air quality assessments that will be updated frequently, such as air quality data, regulatory setting, climate, and topography.

The BAAQMD prepares plans to attain ambient air quality standards in the SFBAAB, including ozone attainment plans (OAPs) for the national ozone standard and clean air plans (CAPs) for the California standard, in coordination with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). Past plans include the 2001 OAP and the 2000 CAP. The 2001 OAP is a revision to the SFBAAB part of the SIP and was prepared in response to the USEPA's partial disapproval of the 1999 OAP. The 2001 OAP for the national 1-hour ozone standard included two commitments for further planning: (1) conduct a mid-course review of progress toward attaining the national 1-hour ozone standard by December 2003; and (2) provide a revised ozone attainment strategy to the USEPA by April 2004.

The 2000 CAP was adopted by the BAAQMD on December 20, 2000 and was then submitted to the CARB. The CCAA requires the BAAQMD to update the CAP for attaining the state 1-hour ozone standard every 3 years. The 2000 CAP is the third triennial update of the BAAQMD's original 1991 CAP. The 2000 CAP includes a control strategy review to ensure that the CAP

includes all feasible measures to reduce ozone, updates to the emissions inventory, estimates of emission reductions, and assessments of air quality trends.

In July 2003, the USEPA proposed an interim final determination that the 2001 OAP corrected the deficiencies of the 1999 OAP and proposed approval of the 2001 OAP. Following 3 years of low ozone levels (2001, 2002, and 2003), the USEPA in October 2003 proposed a finding that the SFBAAB had attained the national 1-hour standard and that certain elements of the 2001 OAP (attainment demonstration, contingency measures, and reasonable further progress) were no longer required. In April 2004, the USEPA made final the finding that the SFBAAB had attained the 1-hour standard and approved the remaining applicable elements of the 2001 OAP: emission inventory, control measure commitments, motor vehicle emission budgets, reasonably available control measures, and commitments to further study measures. However, as part of a transition from the national 1-hour standard to an 8-hour standard, the 1-hour standard was revoked on June 15, 2005 and is no longer applicable (BAAQMD 2006a).

The 8-hour standard took effect in June 2004. In April 2004, the USEPA designated regions for the new national 8-hour standard, and these designations took effect on June 15, 2004. The USEPA formally designated the SFBAAB as a non-attainment area for the national 8-hour ozone standard and classified the region as “marginal,” one of five classes of non-attainment areas for ozone ranging from “marginal” to “extreme.” Compliance with the standard is determined at each monitoring station using an average of the fourth-highest ozone reading for 3 years. A violation at any monitoring station results in a non-attainment designation for the entire region because ozone is a regional pollutant. Monitoring data for the San Martin station for the years 2006, 2007, and 2008 show an average of the fourth-highest ozone values of 76 parts per billion (one part per billion above the standard), hence the SFBAAB’s “marginal” non-attainment classification. Although certain elements of Phase 1 of the 8-hour implementation rule are still undergoing legal challenge, the USEPA signed Phase 2 of the 8-hour implementation rule on November 9, 2005; however, it is not currently anticipated that marginal areas will be required to prepare attainment demonstrations for the 8-hour standard (BAAQMD 2006a).

Nonetheless, there is still a need for continued improvement to meet the state 1-hour ozone standard. The BAAQMD has begun a process to update, in cooperation with MTC and ABAG, the Bay Area Ozone Strategy (BAOS), which was previously adopted by the BAAQMD’s Board of Directors on January 4, 2006. The updated BAOS will describe current conditions, review the SFBAAB’s progress in reducing ozone levels to attain state 1-hour and 8-hour ozone standards, and describe how the SFBAAB’s proposed control strategy will fulfill the CCAA planning requirements for the state 1-hour ozone standard and mitigation requirements for transport of ozone and ozone precursors to neighboring air basins. The control strategy includes stationary source control measures to be implemented through BAAQMD regulations; mobile source control measures to be implemented through incentive programs and other activities; and

transportation control measures to be implemented through programs in cooperation with MTC, local governments, transit agencies, and others.

Overall, the BAOS is a comprehensive document that describes the SFBAAB's strategy for compliance with state 1-hour ozone standard planning requirements and is a significant component of the region's commitment to achieving clean air to protect the public's health and the environment (BAAQMD 2006b).

As of the date of this Draft EIR, the BAAQMD has not adopted quantitative thresholds of significance for construction-related emissions. However, the BAAQMD is developing quantitative CEQA significance thresholds for construction-related emissions of criteria pollutants, precursors, TACs, and GHGs (BAAQMD 2009). The BAAQMD expects to adopt these new thresholds of significance later this year.

Toxic Air Contaminants

Air quality regulations also address TACs, or, in federal parlance, hazardous air pollutants (HAPs). In general, for TACs that may cause cancer, it is assumed that any concentration poses some risk. In other words, it is assumed that there is no threshold level below which adverse health impacts would not be expected to occur. This contrasts with the criteria air pollutants, for which acceptable levels of exposure can be determined and for which ambient standards have been established (see Table 4.13.3). The USEPA and CARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require maximum available control technology (MACT) and best available control technology (BACT) to limit emissions. These, in conjunction with additional rules set forth by the BAAQMD, establish the regulatory framework for TACs. Issues related to NOA and naturally occurring metals as TACs under BAAQMD rules are addressed in Section 4.9, Hazards and Hazardous Materials.

Federal Hazardous Air Pollutant Programs

Title III of the CAAA directed the USEPA to promulgate national emissions standards for HAPs (NESHAP). NESHAPs may differ more for major sources than they do for area sources of HAPs. Major sources are defined as stationary sources with potential to emit more than 10 tons per year (TPY) of any HAP or more than 25 TPY of any combination of HAPs; all other sources are considered area sources. The CAAA called on the USEPA to promulgate emissions standards in two phases. In the first phase (1992–2000), the USEPA developed technology-based emissions standards designed to produce the maximum achievable emissions reduction. These standards are generally referred to as requiring MACT. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), the USEPA is required to promulgate health-risk-based emissions standards where deemed necessary to address risks remaining after implementation of the technology-based NESHAPs.

The CAAA also required the USEPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum applicable to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, Section 219 of the CAAA required the use of reformulated gasoline in selected areas with the most severe ozone non-attainment conditions, to further reduce mobile-source emissions.

State and Local Toxic Air Contaminant Programs

TACs in California are primarily regulated through the Tanner Air Toxics Act (Assembly Bill [AB] 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). AB 1807 sets forth a formal procedure for the CARB to designate substances as TACs. Research, public participation, and scientific peer review are necessary before the CARB can designate a substance as a TAC. To date, the CARB has identified more than 21 TACs and adopted the USEPA's list of HAPs as TACs. Most recently, diesel PM was added to the CARB list of TACs.

Once a TAC is identified, the CARB then adopts an Airborne Toxics Control Measure for sources that emit that particular TAC. If there is a safe threshold at which there is no toxic effect from a substance, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate BACT to minimize emissions.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level prepare a toxic-emissions inventory and a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

The CARB has adopted diesel-exhaust control measures and stringent emission standards for various on-road mobile sources of emissions, including transit buses and off-road diesel equipment (e.g., tractors, generators). Upcoming milestones include the low-sulfur diesel fuel requirement and tighter emission standards for heavy-duty diesel trucks (2007) and off-road diesel equipment (2011) nationwide. Over time, the replacement of older vehicles will result in a fleet that produces substantially lower levels of TACs than currently. Mobile-source emissions of TACs (e.g., benzene, 1,3-butadiene, diesel PM) have been reduced significantly over the last decade and will be reduced further in California through a progression of regulatory measures (e.g., Low-Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of the CARB's Risk Reduction Plan, diesel PM concentrations are expected to be reduced by 75 percent in 2010 and 85 percent in 2020 from the estimated year-2000 level. Current regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced. Emissions from heavy-duty diesel equipment associated with the project would be required to comply with rules outlined above.

The CARB recently published the *Air Quality and Land Use Handbook: A Community Health Perspective*, which provides guidance concerning land-use compatibility with TAC sources (CARB 2005). Although not a law or adopted policy, the handbook offers recommendations for the siting of sensitive receptors near uses associated with TACs, such as freeways and high-traffic roads, commercial distribution centers, rail yards, ports, refineries, dry cleaners, gasoline stations, and industrial facilities, to help limit the exposure of children and other sensitive populations to TACs. CARB received a number of comments on the handbook from air districts, other agencies, real estate representatives, and others. The comments included concern regarding whether the CARB was playing a role in local land-use planning and whether it is valid to rely on static air quality conditions during the next several decades in light of technological improvements, and support for providing information that can be used in local decision making. The CARB may modify the handbook in the future in response to these comments. The handbook is used to assess how much exposure would occur as a result of project implementation.

At the local level, air pollution control or management districts may adopt and enforce CARB control measures. Under BAAQMD Rule 2-1 (General Permit Requirements), Rule 2-2 (New Source Review), and Rule 2-5 (New Source Review of Toxic Air Contaminants), all sources that have the potential to emit TACs are required to obtain permits from the BAAQMD. Permits may be granted if the sources are constructed and operated in accordance with applicable regulations, including new-source review standards and air toxics control measures. The BAAQMD limits emissions and public exposure to TACs through a number of programs and prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors.

The BAAQMD analyzes sources that require a permit (e.g., performs health risk assessments) based on their potential to emit TACs. If it is determined that the project's emissions would exceed the BAAQMD's threshold of significance for TACs, as identified below, the source has to implement the best available control technology for TACs (T-BACT) to reduce emissions. If a source cannot reduce the risk below the threshold of significance even after implementing T-BACT, the BAAQMD will deny the permit. This helps to prevent new problem emissions sources and reduces emissions from existing sources by requiring them to apply new technology when retrofitting. The BAAQMD's air quality permitting process applies to stationary sources; properties that are exposed to elevated levels of TACs from non-stationary sources, and the non-stationary sources themselves (e.g., on-road vehicles), are not subject to air quality permits. Further, for reasons of feasibility and practicality, mobile sources (cars, trucks, etc.) are not required to implement T-BACT even if they have the potential to expose adjacent properties to elevated levels of TACs. Rather, emissions controls on such sources are subject to regulations implemented at the federal and state levels.

Regulation of Odors

The BAAQMD's Regulation 7 (Odorous Substances) places general limitations on odorous substances and specific emission limitations on certain odorous compounds in the SFBAAB. This regulation does not apply until the Air Pollution Control Officer (APCO) receives 10 or more odor complaints within a 90-day period alleging that a person or entity has caused odors perceived at or beyond the source's property line, which are perceived to be objectionable by the complainants in the normal course of their work, travel, or residence. When this regulation becomes effective as a result of complaints, the limits specified in the regulation remain effective until such time as no complaints have been received by the APCO for 1 year. The limits specified by this regulation become applicable again if the APCO receives odor complaints from five or more complainants within a 90-day period.

Greenhouse Gas Emissions

Federal Provisions

With respect to GHGs, the U.S. Supreme Court ruled on April 2, 2007 that CO₂ is an air pollutant as defined under the CAA, and that the USEPA has the authority to regulate GHG emissions. However, no federal regulations or policies regarding GHG emissions are applicable to the proposed project at the time of this writing.

State Provisions

Various state and local initiatives to reduce the state's GHG emissions have raised awareness that, even though the various contributors to and consequences of global climate change are not yet fully understood, global climate change is under way, with real potential for severe, adverse, long-term environmental, social, and economic effects. Because every nation emits GHGs and therefore makes an incremental cumulative contribution to global climate change, global cooperation will be necessary to reduce GHG emissions to a level that can slow or stop the human-caused increase in average global temperatures and associated changes in climatic conditions.

Assembly Bill 1493

In 2002, then-Governor Gray Davis signed AB 1493 (Stats. 2002, ch. 200) (amending Health & Safety Code, § 42823 and adding Health & Safety Code, § 43018.5). AB 1493 required that the CARB develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by the CARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, the CARB in 2004 approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California's existing motor vehicle emission standards. However, in December 2004, car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against the CARB to prevent enforcement of 13 CCR Sections 1900 and 1961, as amended by AB 1493 and 13 CCR 1961.1, contending that California's implementation of regulations that, in effect, regulate vehicle fuel economy violates various federal laws, regulations, and policies. On December 12, 2007, the court rejected the automakers' claim that if California receives appropriate authorization from the USEPA, the provisions of AB 1493 would not be consistent with federal law. The USEPA denied California's request for a CAA waiver to implement AB 1493 in late December 2007. The state of California has filed suit against the USEPA for its decision to deny the CAA waiver.

Executive Order S-3-05

Executive Order S-3-05, signed by Governor Schwarzenegger in 2005, proclaims that California is vulnerable to the impacts of climate change and declares that increased temperatures could reduce the Sierra snowpack, further exacerbate California's air quality problems, and cause a rise in sea levels. To combat those concerns, the Executive Order established total GHG emission targets: emissions are to be reduced to the 2000 level by 2010, to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The Executive Order directed the secretary of the California Environmental Protection Agency (CalEPA) to coordinate a multi-agency effort to reduce GHG emissions to the target levels. The secretary will also submit biannual reports to the governor and state legislature describing: progress made toward reaching the emission targets, impacts of global warming on California's resources, and mitigation and adaptation plans to combat these impacts. To comply with the Executive Order, the Secretary of the CalEPA created the California Climate Action Team (CCAT), made up of members from various state agencies and commissions. CCAT released its first report in March 2006. The report proposed to achieve the GHG targets by building on voluntary actions of California businesses, local governments, and communities, as well as by state incentive and regulatory programs.

Assembly Bill 32, the California Climate Solutions Act of 2006

In 2006, California passed the California Global Warming Solutions Act of 2006 (AB 32) (see California Health and Safety Code Division 25.5, §§ 38500 et seq.), which requires the CARB design and implement emissions limits, regulations, and other measures, such that feasible and cost-effective reductions are achieved in statewide GHG emissions to 1990 levels by 2020 (representing a 25-percent reduction in emissions compared to 1990 levels).

AB 32 establishes a timetable for the CARB to adopt emission limits, rules, and regulations designed to achieve the intent of the act. CARB staff is preparing a scoping plan to meet the 2020 GHG reduction limits outlined in the bill. To meet these goals, California must reduce GHGs by 30 percent below projected 2020 business-as-usual emissions levels or about 10 percent from 2008 levels. In June 2008, the CARB released its Draft Scoping Plan, which estimates a reduction of 169 million metric tons of CO₂e (MMTCO₂-e). Approximately one-third of the emissions reductions strategies fall within the transportation sector and include the following: California Light-Duty Vehicle GHG standards, the Low Carbon Fuel Standard, Heavy-Duty Vehicle GHG emission reductions and energy efficiency and medium and heavy-duty vehicle hybridization, high-speed rail, and efficiency improvements in goods movement. These measures are expected to reduce GHG emissions by 60.2 MMTCO₂-e. Emissions from the electricity sector are expected to be reduced by another 49.7 MMTCO₂-e. Reductions from the electricity sector include building and appliance energy efficiency and conservation, increased use of combined heat and power and solar water heating (AB 1470), the renewable energy portfolio standard (33 percent renewable energy by 2020), and the existing million solar roofs program. Other reductions are expected from industrial sources, agriculture, forestry, recycling and waste, water, and through cap-and-trade programs. Local government actions and regional GHG targets are also expected to yield a reduction of 2 MMTCO₂-e (CARB 2008a). Measures that could become effective during implementation of the proposed project pertain to construction-related equipment and building and appliance energy efficiency. Some proposed measures will require new legislation to implement, some will require subsidies, some have already been developed, and some will require additional effort to evaluate and quantify. Additionally, some emissions reductions strategies may require their own environmental review under CEQA or the National Environmental Policy Act. The proposed project could be subject to measures that are adopted and become effective during the implementation of the proposed project, depending on the project's timeline.

In consultation with the CARB and California Public Utilities Commission, the California Energy Commission (CEC) is currently establishing a GHG emission performance standard for local, public-owned electric utilities (pursuant to Senate Bill [SB] No. 1368). This standard will limit the rate of GHG emissions to a level no higher than the rate of emissions of GHGs for combined-cycle natural gas baseload generation. The rulemaking established a GHG emission performance standard of 1,100 pounds of CO₂ per megawatt-hour of electricity delivered for baseload generation facilities, a process for calculating the emissions of GHGs from baseload facilities and enforcing the standard, and a process for reevaluating and revising as necessary the GHG emission performance standard. This standard must take into consideration the effect of the standard on rates, reliability, and financial resources, while recognizing the intent to encourage use of renewable resources and its goal of environmental improvement.

Senate Bill 97

SB 97, signed August 2007, acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA. (Stats. 2007, ch. 185, enacting Public Resources Code, §§ 21083.05 and 21097.) This bill directs the State Office of Planning and Research (OPR) to prepare, develop, and transmit guidelines to the California Natural Resources Agency for feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, by July 1, 2009. The Resources Agency is required to certify and adopt those guidelines by January 1, 2010.

Senate Bill 375

SB 375, signed July 2007, links transportation planning and funding to general land use planning and CEQA. SB 375 requires metropolitan planning organizations to include strategies for sustainable communities in their regional transportation plans to reduce GHG emissions. SB 375 also aligns planning for transportation and housing and creates specified incentives for the implementation of the strategies.

Assembly Bill 32 Scoping Plan, Draft Recommended Approaches, Draft CEQA Guidelines

In October 2008, the CARB published its *Climate Change Scoping Plan*, which is the state's plan to reduce GHGs in California as required by AB 32 (CARB 2008a). The CARB approved the scoping plan on December 11, 2008.

In addition to the scoping plan, the CARB also released the *Preliminary Draft Staff Proposal: Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act*. The proposal recommends adhering to interim performance standards for project types and emissions sources including construction, energy, water use, waste, transportation, and total mass GHG emissions (CARB 2008b). Specific thresholds and performance criteria for these categories have yet to be developed.

On April 13, 2009, OPR submitted to the Secretary for Natural Resources its proposed amendments to the State CEQA Guidelines for GHG emissions, as required by SB 97. These proposed amendments would provide guidance to public agencies regarding the analysis and mitigation of the effects of GHG emissions in draft CEQA documents. The Natural Resources Agency will formally provide notice and accept public comments in 2009, prior to certifying and adopting the amendments, as required by SB 97.

Local and Regional Provisions

Bay Area Air Quality Management District

The BAAQMD has established a climate protection program to reduce pollutants that contribute to global climate change and affect Bay Area air quality. Measures to promote energy efficiency, reduce VMT, and develop alternative sources of energy can reduce GHG emissions and air pollutants affecting the health of Bay Area residents. The BAAQMD seeks to support current climate protection programs in the region and stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

A central element of the BAAQMD climate protection program is integration of climate protection activities into existing BAAQMD programs. The BAAQMD is continually seeking ways to integrate climate protection into current BAAQMD functions, including grant programs, CEQA commenting, regulations, inventory development, and outreach (BAAQMD 2007).

City and County of San Francisco

In February 2002, the San Francisco Board of Supervisors passed the *Greenhouse Gas Emissions Reduction Resolution* (Number 158-02) committing the City and County of San Francisco to a GHG emissions reductions goal of 20 percent below 1990 levels by the year 2012. The resolution also directs the San Francisco Department of the Environment, the San Francisco Public Utilities Commission (SFPUC), and other appropriate City agencies to complete and coordinate an analysis and local GHG emission reduction action plan. In September 2004, the San Francisco Department of the Environment and the SFPUC published the *Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Emissions* (Plan). Although the San Francisco Board of Supervisors has not formally committed the City to perform the actions addressed in the Plan, and many of the actions require development and commitment of resources, it is a blueprint for GHG emission reductions, and several of the actions are now in progress.

The Plan presents estimates of San Francisco's baseline GHG inventory and reduction targets. It states that burning fossil fuels in vehicles and for energy use in buildings and facilities is the major contributor to San Francisco's GHG emissions; in 1990, burning fossil fuels for these purposes produced approximately 9.1 million tons of CO₂. The Plan also describes recommended emissions reduction actions in the key target sectors—transportation, energy efficiency, renewable energy, and solid waste management—to meet stated goals by 2012.

The Plan presents proposals to reduce annual CO₂ emissions by 2.5 million tons by 2012, a 20 percent reduction below 1990 emissions, including greening vehicle fleets; increasing energy efficiency in public and private buildings; developing renewable energy technologies like solar,

wind, fuel cells, and tidal power; and expanding residential and commercial recycling programs. The roadmap to achieving these goals requires the cooperation of a number of City, regional, and state agencies as well as private sector partners. The City is already implementing a wide range of actions (e.g., transportation, solar, and energy efficiency) to reduce GHG emissions.

Greenhouse Gas Reduction Ordinance

In May 2008, San Francisco adopted an ordinance amending its Environment Code to establish GHG emission targets and action plans, to authorize the Department of the Environment to coordinate efforts to meet these targets, and to make environmental findings. The ordinance establishes the following GHG emission reduction limits and target dates for San Francisco:

- Determine 1990 City GHG emissions by 2008 (baseline level with reference to which target reductions are set);
- Reduce GHG emissions by 25 percent below 1990 levels by 2017;
- Reduce GHG emissions by 40 percent below 1990 levels by 2025; and
- Reduce GHG emissions by 80 percent below 1990 levels by 2050.

The ordinance also requires City departments to prepare Climate Action Plans that assess and report GHG emissions and to prepare recommendations to reduce emissions. The San Francisco Planning Department is also required to: (1) update and amend the City's applicable General Plan elements to include the emissions reduction limits set forth in the GHG reduction ordinance and policies to achieve those targets; (2) consider a project's impact on the City's GHG reduction limits as part of its review under CEQA; and (3) work with other City departments to enhance the "transit first" policy to encourage a shift to sustainable modes of transportation, thereby reducing emissions and helping to achieve the targets set forth by the ordinance.

San Francisco Public Utilities Commission Projects

The SFPUC is also developing energy-efficiency and renewable generation projects. To date, several renewable generation projects have been constructed, and many more are in the planning, design, or construction phases. For instance, in 2002, the SFPUC installed a small reciprocating engine to use biogas recovered from the Oceanside Water Treatment Control Plant. In 2003, a 2 megawatt biogas plant began operation at the Southeast Water Treatment Control Plant. Both of these plants use sewage-produced CH₄ that would otherwise be flared-off. In addition, the SFPUC has completed several solar electric projects for City facilities. The first project, a 675-kilowatt solar electric photovoltaic (PV) system, is located on the Moscone Convention Center's roof. This project generates 826,000 kilowatt-hours of electricity per year and provides a solar showplace for visitors.

Additional solar PV projects in operation include a 255-kilowatt project at the Southeast Water Pollution Control Plant and a 245-kilowatt project at Pier 96, the Norcal recycling facility. Five other solar PV projects are currently under construction. The SFPUC has also installed pyranometers at 19 sites on City buildings and schools to collect data about the availability of sunlight, as well as instruments to measure wind speed and ambient temperature. The variability in solar incidence is based on microclimate and geography, and when used in conjunction with availability of appropriate space suggests potential future solar PV project sites.

The SFPUC also manages and implements energy-efficiency projects in municipal buildings and facilities and provides energy-efficiency services such as energy audits and design and construction management. Energy retrofit technologies include energy-efficient lighting; heating, ventilating, and air conditioning (HVAC); motors; controls; and energy management systems.

Municipal energy-efficiency and renewable generation projects are funded by Hetch Hetchy power sales net revenue as well as state grants and loans, among other funding mechanisms. Funds that the SFPUC designates for energy projects are appropriated in a project account called the Mayor's Energy Conservation Account (MECA). MECA is a financing mechanism allowing the SFPUC to make a loan to a city department to fund an energy project. For energy-efficiency projects, loans can be paid back through the department's energy savings. As of 2007, the SFPUC had invested \$24 million in energy-efficiency projects and estimates that this reduced peak demand by approximately 3,800 kilowatts and CO₂ emissions by approximately 11,000 TPY. Municipal solar PV projects have been funded by SFPUC Power Enterprise such that client departments pay the same rate for solar power as they would normally pay for that power from the city's Hetch Hetchy hydroelectric generation. To date, 2 megawatts of municipal solar plants have been installed or are under construction for an investment (before rebates) of about \$20 million.

Municipal energy-efficiency projects recently completed or under way include: lighting retrofits at Moscone Convention Center (North and South), San Francisco General Hospital, mental health clinics, city parking garages, Golden Gate Park, and West Portal Library; Department of Parking and Traffic light-emitting diode (LED) traffic signal conversions; efficient refrigerators at Housing Authority facilities; motor replacements at the Southeast Wastewater Treatment Plant; and efficient lighting, HVAC, building shell, and energy management control upgrades at the new Moscone West Convention Center. As part of the Department Climate Action Plans under the 2008 Greenhouse Gas Reduction Ordinance, each department is to identify whether its buildings are suitable for solar installation and develop a funding plan for such capital improvements.

The SFPUC is also looking at several Bay Area sites for wind power development and has installed wind monitoring equipment at five sites in and around the City. Additional data are being obtained for City property in the Sierra foothills.

As part of the Water System Improvement Program (WSIP), the SFPUC has committed to the following GHG reduction actions, in addition to the items set forth above:

- A. The SFPUC will include the first two measures in all WSIP contractor specifications and implement the third measure during project planning and design, which in addition to having other environmental benefits, would also help reduce GHG emissions.
 - 1. The SFPUC will require that all contractors maintain tire inflation to the manufacturers' inflation specifications.
 - 2. The SFPUC will implement a construction worker education program for all WSIP projects.
 - 3. WSIP projects that include construction of new buildings will consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures into project design. Projects with building components will attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent. Projects with building components will attempt to meet or exceed Leadership in Energy and Environmental Design (LEED) Silver certification as required by the City's Green Building Ordinance.
- B. Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, presents mitigation measures that would be implemented as part of the project; some of these measures would also help reduce GHG emissions. In addition, CARB regulations (Title 13 of the California Code of Regulations, §§ 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit GHG emissions associated with project-related construction vehicles.

Measure 4.15-2 (Incorporation of Energy Efficiency Measures) of the *SFPUC Water System Improvement Program EIR* states the following: consistent with the Energy Action Plan II priorities for reducing energy usage, the SFPUC will ensure that energy-efficient equipment is used in all WSIP projects. A repair and maintenance plan will also be prepared for each facility to minimize power use. The potential for use of renewable energy resources (such as solar power) at facility sites will be evaluated during project-specific design.

4.13.2 IMPACTS

4.13.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for air quality impacts but generally considers that implementation of the project would have a significant air quality impact if it were to:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- Expose sensitive receptors to substantial pollutant concentrations;
- Create objectionable odors affecting a substantial number of people;
- Conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32 (California Global Warming Solutions Act of 2006), such that the project's GHG emissions would result in a substantial contribution to global climate change; or
- Conflict with San Francisco's *Climate Action Plan* such that it would impede implementation of the local GHG reduction goals established by the 2008 *Greenhouse Gas Reduction Ordinance*.

4.13.2.2 APPROACH TO ANALYSIS

As stated in Appendix G of the State CEQA Guidelines, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the above determinations. Thus, as identified by the BAAQMD, implementation of the proposed project would result in significant air quality impacts if (BAAQMD 1999):

- BAAQMD-recommended control measures are not incorporated into project design or implemented during project construction;
- Long-term operational (regional) emissions of ROG, NO_x, or PM₁₀ exceed the BAAQMD-recommended mass emissions threshold of 15 TPY or 80 pounds per day (lb/day);
- Long-term operational (local) mobile-source emissions of CO violate or contribute substantially to a violation of the NAAQS or CAAQS;
- Sensitive receptors are exposed to a substantial incremental increase in TAC emissions (e.g., stationary or mobile-source) that exceed 10 chances per million for excess cancer risk and/or a hazard Index of 1 for non-cancer risk at the Maximally Exposed Individual (MEI); or
- Sensitive receptors would be located near an existing odor source where one confirmed complaint per year averaged over a 3-year period, or three unconfirmed complaints per year averaged over a 3-year period have been experienced by existing receptors as close as the project to the odor source; or by existing receptors in the vicinity of a similar facility considering distance, frequency, and odor control, where there is currently no nearby development and for proposed odor sources near existing receptors.

The analysis of project-generated short-term construction-related and long-term operation-related emissions is consistent with the BAAQMD recommendations. It includes a discussion of the

generation of temporary, short-term construction-related emissions of criteria air pollutants and precursors. In accordance with the BAAQMD's approach to CEQA analyses, the determination of significance is based on the implementation of control measures (BAAQMD 1999).

The impact analysis also includes a discussion of the generation of long-term, operation-related (regional and local) emissions of criteria air pollutants and precursors. The evaluation of operation-related emissions is based on the potential number of vehicle trips that would be generated by the proposed project (refer to Table 4.12.2, in Section 4.12, Transportation and Circulation), and proposed new stationary emission sources.

Project-generated construction- and operation-related emissions of TACs and odors are qualitatively assessed for the potential to expose sensitive receptors to levels that exceed BAAQMD-recommended criteria.

Construction-related air quality effects were determined by comparing results with applicable BAAQMD significance criteria. Mitigation measures are recommended, as necessary, to reduce significant air quality impacts to less-than-significant levels.

Project-generated GHG emissions were quantified based on methodologies and emission factors recommended by the BAAQMD (e.g., 0.27 gallons of fuel burned per cubic yard of earth moved) and CCAR (e.g., 9.96 kilograms of CO₂ per gallon of California Low Sulfur Diesel fuel burned) to determine whether project implementation would conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (i.e., whether project GHG emissions would result in a substantial contribution to global climate change), as set forth by the timetable established in AB 32 or with San Francisco's *Climate Action Plan* such that the project would impede implementation of the local GHG reduction goals established by the 2008 *Greenhouse Gas Reduction Ordinance*.

As stated above under "Regulatory Setting," the BAAQMD has not adopted quantitative thresholds of significance for construction-related emissions at this time. However, the BAAQMD is developing quantitative CEQA significance thresholds for construction-related emissions of criteria pollutants, precursors, TACs, and GHGs (BAAQMD 2009). The BAAQMD expects to adopt these new thresholds of significance later this year. Therefore, in anticipation of the BAAQMD's future adoption of new quantitative significance thresholds for construction-related emissions, this Draft EIR also includes a quantitative analysis of the project's construction-related emissions based on the draft BAAQMD significance thresholds and worst-case assumptions regarding the project's construction emissions.

4.13.2.3 PROJECT IMPACTS

Table 4.13.4 summarizes the project-related air quality impacts described in this section.

Table 4.13.4: Summary of Air Quality Impacts

Impact	Level of Significance
4.13.1: Impact of short-term increases in emissions of criteria air pollutants and precursors.	LSM/SU*
4.13.2: Impact of long-term generation of regional and local criteria air pollutants and precursors.	LS
4.13.3: Impact of exposing nearby populations to short-term project-generated emissions of diesel PM.	LSM
4.13.4: Impact of exposing sensitive receptors to long-term emissions of TACs.	NI
4.13.5: Impact of exposing sensitive receptors to emissions of odors.	LS
4.13.6: Impact of increasing criteria air pollutant and ozone precursor emissions that would conflict with or obstruct implementation of the applicable air quality plan.	LS
4.13.7: Impact of increasing GHG emissions that conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (e.g., a substantial contribution to global climate change) or conflict with San Francisco's <i>Climate Action Plan</i> such that emissions would impede implementation of the local GHG reduction goals established by San Francisco's 2008 Greenhouse Gas Reduction Ordinance.	LS/SU*
<i>Notes:</i> NI – No impact LS – Less than significant LSM – Less than significant with mitigation SU – Significant and Unavoidable * SU Impact applies only under the newly proposed BAAQMD construction emissions CEQA thresholds of significance.	

Impact 4.13.1: Impact of short-term increases in emissions of criteria air pollutants and precursors.

Although construction emissions would be temporary in duration (4 years), they would still have the potential to have a significant impact on air quality. Emissions of criteria pollutant precursors (e.g., ROG and NO_x) are primarily associated with motor vehicle and heavy-duty equipment exhaust and application of architectural coatings. Fugitive PM₁₀ dust emissions are primarily associated with ground disturbance and material transport and vary as a function of parameters such as soil silt content and moisture, wind speed, acreage of disturbance area, and construction equipment VMT.

Project construction-related activities would generate temporary, short-term emissions of criteria air pollutants (e.g., PM₁₀) and precursors (e.g., ROG and NO_x) from motor vehicle travel (e.g.,

construction employee commute and meal trips), heavy truck travel on proposed haul routes for material transport, and heavy-duty construction equipment at the proposed borrow, staging, disposal, and dam construction sites (e.g., earth movers). (See Figure 3.8, Work Limit Area; Figure 3.10, Locations of Borrow Areas; Figure 3.11, Locations of Staging Areas; Figure 3.12, Locations of Disposal Sites; and Figure 3.13, Existing Roads, Proposed Roads, and Haul Route Options. Also see Chapter 3 for project-specific data on construction-related activities.)

The use of explosives (e.g., Trinitrotoluene, an oxygen-deficient explosive) may generate CO and, to a lesser extent, PM and NO_x. Emissions from explosives detonation are influenced by many factors such as explosives composition, product expansion, method of priming, length of charge, and confinement, which are not known at this time. These factors are difficult to measure and control in the field and almost impossible to duplicate in a laboratory test facility. Any estimates of emissions from explosive use must be regarded as approximations and cannot be made more precise because explosives are not used in a precise, reproducible manner. The primary constituent of concern associated with the use of explosives would be particulate matter; however, there is no effective way of quantifying the amount of dust generated.

According to the BAAQMD, PM₁₀ is the pollutant of greatest concern with respect to construction-related emissions. Although heavy-duty equipment, material transport, and employee commutes result in emissions of criteria air pollutants (e.g., CO) and precursors (e.g., ROG and NO_x), these emissions are included in the regional emissions inventory, which serves as the basis for the air quality plans, and are not expected to impede attainment of the ozone standard or maintenance of the CO standard in the SFBAAB. Consequently, the BAAQMD has not adopted mass emission thresholds for construction-related emissions of ROG and NO_x and bases its determination of significance on consideration of the fugitive PM₁₀ dust control measures to be implemented (BAAQMD 1999).

The BAAQMD's approach to CEQA analyses of construction-related fugitive PM₁₀ dust emissions is to require implementation of effective, comprehensive control measures rather than a detailed quantification of construction emissions. The BAAQMD requires that all feasible control measures, which are dependent on the size of the construction area and the nature of the activities involved, shall be incorporated into project design and implemented during project construction. Not all BAAQMD-recommended mitigation measures for control of fugitive PM₁₀ dust and equipment exhaust emissions are currently incorporated into the project description. Thus, project-generated, construction-related emissions of criteria air pollutants and precursors could violate or contribute substantially to an existing or projected air quality violation and/or expose sensitive receptors to substantial pollutant concentrations, especially considering the region's non-attainment status.

Impact Conclusion

Implementation of the project would result in short-term project-generated increases in construction-related emissions of criteria air pollutants and precursors from motor vehicle travel, heavy truck travel, and heavy-duty construction equipment. This would be a significant impact.

The BAAQMD considers construction-related emissions from all projects in this region to be mitigated to a less-than-significant level if BAAQMD-recommended fugitive PM₁₀ dust controls (e.g., watering, sweeping, and stabilizing) and equipment exhaust emission controls (e.g., use of grid power, reduction of idling, and low-emissions tuning up of equipment), outlined in Mitigation Measures 5.13.1a and 5.13.1b, respectively, are implemented. Therefore, it is expected that implementation of applicable BAAQMD dust and exhaust control measures (Measures 5.13.1a, 5.13.1b, and 5.9.2a for NOA [refer to Section 4.9, Hazards and Hazardous Materials, for NOA and naturally occurring metals-related measures]) would reduce this impact to a less-than-significant level.

As stated above, the Calaveras Dam Replacement Project (CDRP) construction-related emissions would be less than significant with mitigation in accordance with the current *BAAQMD CEQA Guidelines* in effect at the time of this Draft EIR, which do not require quantification of construction-related emissions. However, in anticipation of the future implementation of proposed new BAAQMD CEQA quantitative thresholds of significance for construction-related emissions, this Draft EIR provides a quantitative analysis of the project's construction emissions to determine whether they would exceed the proposed thresholds. Worst-case, construction-related emissions of criteria air pollutants and precursors were modeled in accordance with BAAQMD-recommended methodologies. Emissions of criteria air pollutants and precursors were modeled based on project specifications (e.g., amount and type of equipment) described in Section 3.5, Project Construction, in Chapter 3, and default and BAAQMD-recommended settings and parameters attributable to the activity period and site location.

Table 4.13.5 summarizes the modeled project-generated, construction-related emissions of each criteria air pollutant and precursor and accounts for the reduction in emissions from implementation of best management practices required under Mitigation Measure 5.13.1. Appendix G shows the detailed modeling input parameters and results. The modeling results indicate that implementation of the proposed project would result in worst-case construction-related emissions of approximately 81 lb/day and 11 TPY of ROG, 394 lb/day and 52 TPY of NO_x, 399 lb/day and 53 TPY of CO, 1 lb/day and 0 TPY of SO₂, 1,672 lb/day and 169 TPY of PM₁₀, and 1,518 lb/day and 153 TPY of PM_{2.5}.

Table 4.13.5: Summary of Modeled Worst-Case Construction-Related Criteria Air Pollutant, Ozone Precursor, and Greenhouse Gas Emissions

Source	Emissions (lb/day) ^{1,2}							Emissions (TPY) ^{1,2}						
	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂ e	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}	CO ₂ e
Worker Commute Vehicle Exhaust	2.2	2.7	33.5	0.0	0.5	0.0	45,482.2	0.3	0.4	4.4	0.0	0.1	0.0	6,003.6
Off-Site, On-Road Material Delivery Truck Exhaust	3.1	37.9	20.2	0.1	1.5	1.3		0.4	5.0	2.7	0.0	0.2	0.2	
On-Site, Off-Road Heavy-Duty Equipment Exhaust	79.4	441.9	363.2	0.7	26.0	23.9		10.5	58.3	48.0	0.1	3.4	3.2	
Fugitive Dust					1,649.8	1,517.8						166.3	153.0	
Total Emissions	84.7	485.5	398.2	0.8	1,672.2	1,543.0	45,482.2	11.2	63.7	55.1	0.1	169.2	155.6	6,003.6

Notes: BAAQMD = Bay Area Air Quality Metropolitan District; CARB = California Air Resources Board; CH₄ = methane; CO = carbon monoxide; CO₂e = carbon dioxide equivalent; N₂O = nitrous oxide; NO_x = nitrogen oxides; PM_{2.5} = fine particulate matter; PM₁₀ = respirable particulate matter; ROG = reactive organic gases; SFBAAB = San Francisco Bay Area Air Basin; SO₂ = sulfur dioxide; USEPA = U.S. Environmental Protection Agency.

¹ ROG, NO_x, CO, SO₂, PM₁₀, and PM_{2.5} emissions are based on CARB (e.g., EMFAC) and USEPA (i.e., AP-42) emission factors contained in the Construction Emissions Model, Version 5.2 and URBEMIS 8.70, general information provided in the project description, and default model settings and parameters. Assumes use of trucks rather than barges for transport from Borrow Area E.

² CO₂e emissions are BAAQMD and California Climate Action Registry factors and account for CO₂, CH₄, and N₂O.

Refer to Appendix G, Air Quality Modeling, for all input assumptions and modeling results.

Source: Data modeled by ETJV, prepared by EDAW in 2009

These worst-case emissions assume that the activities that overlap according to the anticipated construction schedule would occur simultaneously and that all material transport on- and off-site would involve use heavy-duty trucks. However, as explained in Chapter 3, Project Description, Haul Route Option 2 would involve using barges to cross the reservoir. If this option were used, the construction-related, off-road heavy-duty truck emissions (e.g., exhaust and fugitive dust emissions from travel on unpaved roads) associated with using Borrow Area E (i.e., 81 lb/day and 11 TPY of ROG, 394 lb/day and 52 TPY of NO_x, 399 lb/day and 53 TPY of CO, 1 lb/day and 0 TPY of SO₂, 1,672 lb/day and 169 TPY of PM₁₀, and 1,518 lb/day and 153 TPY of PM_{2.5}) that are included in the worst-case emissions in Table 4.13.5 would be replaced with barge-related emissions. Specifically, implementing Haul Route Option 2 would result in barge-related emissions of 77 lb/day and 10 TPY of ROG, 621 lb/day and 82 TPY of NO_x, 395 lb/day and 52 TPY of CO, 4 lb/day and 1 TPY of SO₂, 854 lb/day and 94 TPY of PM₁₀, and 762 lb/day and 87

TPY of PM_{2.5}, which would be less than the off-road heavy-duty truck emissions of ROG, CO, PM₁₀, and PM_{2.5} associated with using Borrow Area E. Emissions of NO_x and SO₂ would be higher under Haul Route Option 2.

In accordance with the BAAQMD draft thresholds of significance for construction-related emissions, a project would have a significant impact on air quality if construction-related emissions were to exceed 54 lb/day of ROG or NO_x, 547 lb/day of CO, 219 lb/day of SO₂, 54 lb/day of PM_{2.5}, or 82 lb/day of PM₁₀. Based on the worst-case analysis above, construction-related emissions would be below the draft BAAQMD significance thresholds for CO and SO₂ but could exceed the thresholds for ROG, NO_x, PM₁₀, and PM_{2.5}. Implementation of the BAAQMD fugitive dust controls identified in Mitigation Measure 5.13.1a, BAAQMD exhaust controls identified in Mitigation Measure 5.13.1b, and the enhanced dust controls for work in areas containing naturally occurring asbestos under Mitigation Measure 5.9.2a would reduce PM₁₀ and PM_{2.5} emissions by at least 75 percent. However, even with these reductions, construction-related emissions of PM₁₀ and PM_{2.5} would likely exceed the draft thresholds of significance of 82 lb/day and 54 lb/day, respectively.

Implementing BAAQMD exhaust controls identified in Mitigation Measures 5.13.1b, 5.13.3a and 5.13.3b would reduce construction-related emissions of ROG and NO_x by at least 5 percent and 20 percent, respectively. Based on existing and feasible mitigation strategies, the project's worst-case construction-related emissions of ROG, NO_x, PM₁₀, and PM_{2.5} cannot be reduced below the proposed BAAQMD thresholds. To be in compliance with the proposed BAAQMD thresholds, ROG emissions would need to be reduced by 35 percent, NO_x emissions by 89 percent, PM₁₀ emissions by 98.5 percent, and PM_{2.5} emissions by 98.2 percent. At this time, no feasible mitigation exists that would reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by these percentages and thus below the proposed BAAQMD thresholds. Therefore, construction-related emissions of ROG, NO_x, PM₁₀, and PM_{2.5} would have potentially significant and unavoidable impacts on air quality in accordance with the proposed BAAQMD thresholds of significance.

Impact 4.13.2: Impact of long-term generation of regional and local criteria air pollutants and precursors.

Implementation of the proposed project would not increase emissions of criteria air pollutants (e.g., CO, SO₂, PM₁₀, and PM_{2.5}) and precursors (e.g., ROG and NO_x), because operation- and maintenance-related activities would be, in effect, unchanged compared with those under existing conditions. Following construction of the replacement dam, the office, vehicle maintenance, and other structures that would be built to accommodate contractor and personnel during project construction would be removed. The number of personnel on site during construction would be reduced to the small number who would operate and maintain the facilities. Thus, operation-related activities would not result in a significant change in emissions in comparison to existing conditions. Project-generated emissions of ROG, NO_x, CO, SO₂, PM₁₀, or PM_{2.5} would not

exceed the BAAQMD's significance criteria of 15 TPY or 80 lb/day (BAAQMD 1999). Consequently, project-generated, operation-related emissions of criteria air pollutants and precursors would not violate standards or contribute substantially to an existing or projected air quality violation and/or expose sensitive receptors to substantial pollutant concentrations. In addition, because the BAAQMD's significance criteria approximately correlate with heavy-duty vehicle and land use project emission reduction requirements in the SIP, project-generated emissions would also not conflict with any air quality planning efforts.

Impact Conclusion

Emissions of criteria air pollutants and precursors during project operation would be small and approximately the same as at present. Thus, this would be a less-than-significant impact.

Impact 4.13.3: Impact of exposing nearby populations to short-term project-generated emissions of diesel PM.

During construction of the proposed project, nearby populations may be exposed to diesel PM from diesel-fueled off-road and stationary equipment, trucks used to haul material and deliver equipment, and commuting vehicles driven by workers. As discussed above, diesel PM has been classified as a likely human carcinogen by the USEPA, and it has been identified as a TAC by CARB. As discussed under "Approach to Analysis," above, exposure of nearby populations to project-related TAC emissions that exceed 10 chances per million for excess cancer risk and/or a Hazard Index of 1 for non-cancer risk at the MEI would be considered a significant impact. Based on a preliminary screening analysis, it appears that unmitigated construction-related diesel PM emissions would exceed the significance threshold for excess cancer risk for various populations (including residents and off-site workers) in the general vicinity of the project. Therefore, construction-related emissions of diesel PM would have a significant impact.

To reduce diesel PM emissions during project construction, Mitigation Measure 5.13.1b requires scheduled tune-ups of construction vehicles and equipment to maintain low emissions and limits idling of all non-commuting diesel vehicles and equipment to a maximum of 5 minutes.¹ Mitigation Measure 5.13.3a requires all off-road diesel construction equipment to be equipped with USEPA Tier 2 engines and CARB Level 3 (greater than or equal to 85 percent abatement efficiency) Diesel Emission Control Strategies. Mitigation Measure 5.13.3b requires use of 2004 model year or newer engines for haul trucks limited to on-site routes.

To determine whether Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would be adequate to reduce the cancer and non-cancer risks associated with project-related diesel PM emissions to below the significance thresholds identified above, a Health Risk Screening Analysis (HRSA) was prepared. The HRSA quantifies the human health risk related to exposure to project-

¹ It is assumed that worker commuting vehicles (of which less than 1 percent are diesel fueled) have negligible idling.

generated diesel PM with the mitigation measures in place. The complete results of the analysis are provided in *Data Report for Health Risk Screening Analysis of Diesel Particulate Emissions Associated with Calaveras Dam Replacement Project, Alameda and Santa Clara Counties, California* (ENVIRON 2009), and are summarized below. The HRSA was conducted using ISCST3, an air dispersion model developed under the sponsorship of the USEPA, using screening meteorological data. The dispersion modeling estimated the concentration of diesel PM in the air from diesel-fueled temporary construction equipment (stationary and mobile), trucks delivering equipment and supplies to the site, trucks transporting materials, and on-road commuting vehicles driven by employees. The estimated diesel PM concentrations were then used to estimate the excess cancer and non-cancer health risk to nearby populations in accordance with BAAQMD risk screening guidelines. The nearby populations evaluated in the HRSA include residents, off-site workers at SFPUC facilities, non-SFPUC and EBRPD off-site workers, and EBRPD hikers and campers.

The HRSA assumed that Haul Route Option 1, the west haul road route, would be used because this is the worst-case scenario for diesel PM emissions. The off-road construction equipment emissions were estimated assuming USEPA Tier 2 diesel engines employing CARB Level 3 Diesel Emission Control Strategies (85-percent reduction in PM emissions) in accordance with Mitigation Measure 5.13.3a. Emissions from haul trucks restricted to on-site routes were estimated assuming that construction vehicles and equipment would have regularly scheduled tune-ups, idling time for non-commuting diesel-fueled vehicles and equipment would be limited to 5 minutes, and these haul trucks would be model year 2004 or newer, as required by Mitigation Measures 5.13.1b and 5.13.3b.²

As summarized in Table 4.13-6 below, the results of the HRSA indicate that with the implementation of Mitigation Measures 5.13.3a and 5.13.3b, the potential excess cancer risk from diesel PM emissions at the MEI for the various populations evaluated would be less than the significance threshold of 10 in 1 million for cancer risk and that the non-cancer risk would be less than the threshold of Hazard Index 1 (ENVIRON 2009).

The watershed keeper's residence, located on a terrace on the east shore of the reservoir just south of the existing dam, is the nearest receptor to the construction site where diesel PM emissions would occur during construction. This residence would be vacated during construction. Another SFPUC watershed keeper's residence is located approximately 5 miles to the north, in Sunol Valley (225 feet east of Calaveras Road, near Alameda East Portal). The results of an HRSA conducted for the watershed keeper's residence on Calaveras Road indicated that the human health risk attributable to exposure to project-generated diesel PM is less than the BAAQMD thresholds of 10 in 1 million for cancer risk and 1 for the non-cancer Hazard Index.

² It is assumed that worker commuting vehicles (of which less than 1 percent are diesel fueled) have negligible idling.

Table 4.13.6: Summary of Potential Health Risk from Project Construction with Mitigation

Type of Estimated Health Impact	Cancer Risk (per 1,000,000)	Chronic Hazard Quotient ¹
Residents		
Maximum exposed individual resident, adult	5.2	0.06
Maximum exposed individual resident, child	9.96	0.06
Workers		
Maximum exposed individual worker, adult	6.4	0.06
Campers		
Maximum exposed individual camper, adult	0.3	--*
Maximum exposed individual camper, child	0.6	--*
Hikers		
Maximum exposed individual hiker, adult	2.0	--*
Maximum exposed individual hiker, child	4.9	--*
BAAQMD Threshold of Significance	10	1
* A chronic Hazard Quotient is not estimated for campers and hikers/day visitors because exposures are expected to be discontinuous over short durations and do not allow for estimation of chronic non-cancer endpoints.		
¹ The Hazard Quotient is equivalent to the Hazard Index because only a single chemical was evaluated in this HRSA.		

Source: ENVIRON 2009

Rock types known to contain NOA are mapped within the Calaveras Fault zone and on the western side of Observation Hill, as well as beneath the Calaveras Creek channel downstream of the existing dam, at the right abutment of the existing dam, in the hillside east of the dam, and at a source of the fill. Construction-related activities (e.g., ground disturbance) at these locations could result in the airborne entrainment of NOA. The issues related to the generation of airborne particulate matter that potentially contains NOA and naturally occurring metals are presented in Section 4.9, Hazards and Hazardous Materials.

Impact Conclusion

With the implementation of Mitigation Measures 5.13.1b, 5.13.3a and 5.13.3b, impacts from construction-related emissions of diesel PM would be less than significant.

Impact 4.13.4: Impact of exposing sensitive receptors to long-term emissions of TACs.

Project operations would not result in an increase in long-term emissions of TACs because operation- and maintenance-related activities would be unchanged compared with those under existing conditions. Following construction of the replacement dam, the office, vehicle maintenance, and other structures that would be built to accommodate contractor and personnel during project construction would be removed. The number of personnel serving on-site during

construction would be reduced to the small number currently operating and maintaining the facilities. As noted in Impact 4.13.3, sensitive receptors also are located at sufficient distances from the project site to prevent exposures. As a result, there would be no impact.

Impact 4.13.5: Impact of exposing sensitive receptors to emissions of odors.

Construction-related activities would result in emissions of diesel exhaust from heavy-duty truck travel on proposed haul routes for materials transport and from heavy-duty construction equipment at the proposed borrow, staging, disposal, and dam construction sites. Emissions of diesel exhaust are generally intermittent and temporary and are highly dispersive in nature (Zhu et al. 2002). In addition, as noted in Impact 4.13.3, sensitive receptors are sufficiently distant from the sources to result in insubstantial exposure to odors.

Odors from barge diesel exhaust (Option 2) would not affect any sensitive receptors.

Operation of the proposed project would not result in an increase in long-term operation-related emissions of odors because operation- and maintenance-related activities would be essentially unchanged compared with those under existing conditions. Thus, project-generated construction- and operation-related emissions of odors would not create objectionable odors affecting a substantial number of people. This would be a less-than-significant impact.

Impact 4.13.6: Impact of increasing criteria air pollutant and ozone precursor emissions that would conflict with or obstruct implementation of the applicable air quality plan.

The BAAQMD's air quality planning efforts would pertain to construction and operation of the proposed project, including efforts to reduce criteria air pollutant and ozone precursor emissions, as discussed below.

Regional air quality plans address measures to reduce criteria air pollutants and ozone precursors. Potential increases in criteria air pollutants and precursors during construction and operation are identified and consistency with state and federal standards is evaluated under Impacts 4.13.1 and 4.13.2. Although construction-related emissions were determined to be significant when compared to BAAQMD thresholds, criteria air pollutant and precursor emissions associated with operation of the proposed project were determined to be less than significant.

The project would be consistent with the BAAQMD's BAOS (BAAQMD 2006b), the most recently adopted regional air quality plan that pertains to the project. The consistency of the project with the BAOS was determined by comparing the project's growth assumptions with BAOS growth assumptions, which are based on ABAG population projections. Because the CDRP would not directly induce population growth, the project would also be consistent with the BAOS. (Refer to Section 6.1, Growth Inducement, for more discussion on the comparison of project growth assumptions and the indirect contribution to WSIP growth inducement and ABAG

projections.) Thus, project-generated emissions would not conflict with any air quality planning efforts regarding criteria air pollutant or precursor emissions.

Impact Conclusion

With respect to criteria air pollutant and precursor emissions, the project would be consistent with the BAAQMD's BAOS. In addition, operation-related activities would not result in a significant change in emissions compared to existing conditions. Thus, project-generated emissions would also not conflict with any air quality planning efforts. This would be a less-than-significant impact.

Impact 4.13.7: Impact of increasing GHG emissions that conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (e.g., a substantial contribution to global climate change) or conflict with San Francisco's *Climate Action Plan* such that emissions would impede implementation of the local GHG reduction goals established by San Francisco's 2008 Greenhouse Gas Reduction Ordinance.

Project construction-related activities would generate temporary, short-term GHG emissions (e.g., CO₂) from motor vehicle travel (e.g., construction employee commute and meal trips), heavy truck travel on proposed haul routes for material transport, and heavy-duty construction equipment at the proposed borrow, staging, disposal, and dam construction sites (e.g., earth movers). Table 4.13.5 summarizes the modeled project-generated, construction-related GHG emissions. These emissions would contribute to regional increases in GHG emissions and associated climate change effects, but no state, local, or regional air quality agency has adopted a methodology or quantitative threshold that can be applied to a specific development or construction project to evaluate the significance of an individual project's contribution. Therefore, this analysis considers GHG emissions from project implementation in relation to total GHG emissions in the Bay Area and California. It also considers steps that California intends to take to reduce GHG emissions and actions the City and County of San Francisco and SFPUC are taking to reduce GHG emissions, including the City's *Climate Action Plan* and 2008 Greenhouse Gas Reduction Ordinance.

Use of barges for hauling (Option 2) would result in fewer worst-case CO₂ emissions.

The Bay Area Greenhouse Gas Emission Inventory Projections (BAAQMD 2008) indicate that construction and mining equipment emissions currently account for approximately 4 percent of total mobile-source emissions and will continue to account for about the same proportion into the future (projected to 2016). Modeling indicates that implementation of the proposed project would result in worst-case construction-related emissions of approximately 45,482 lb/day and 6,003 TPY of CO₂e. The current statewide annual GHG inventory is estimated at 427,000,000 metric tons (CEC 2006). Peak project construction activities would represent 0.00014 percent of the

statewide total emissions during the time these activities are carried out. Use of barges for hauling (Option 2) would result in fewer worst-case emissions of CO₂e.

Existing CARB regulations (Title 13 of the California Code of Regulations, §§ 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit GHG emissions associated with construction-related vehicles. In addition, the CARB's proposed Early Action Measures (EAMs) (pursuant to the California Global Warming Solutions Act of 2006) include other emission reduction measures for diesel trucks and diesel off-road equipment. The CARB is expected to review and adopt the EAMs by January 1, 2010, so equipment used for construction of the proposed project after 2010 could be subject to these requirements.

Subsequent to the release of the proposed EAMs, the CARB developed the *AB 32 Scoping Plan* outlining the state's strategy to achieve AB 32's 2020 GHG emissions limit. Once measures from the EAM and *Scoping Plan* go into effect, the SFPUC and construction contractors on SFPUC projects would be subject to these requirements, and the SFPUC will implement these measures as required; emissions from SFPUC construction activities would be reduced accordingly. In addition, the SFPUC is committed to the following GHG reduction actions:

1. The SFPUC will require that contractors maintain tire inflation to the manufacturers' inflation specifications.
2. The SFPUC will implement a construction worker education program.
3. Contractors who construct new buildings will consult with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all applicable energy efficiency measures into the project design. Project buildings will attempt to maximize energy efficiency by exceeding Title 24 minimum requirements by at least 20 percent. Project buildings will attempt to meet or exceed LEED Silver certification as required by the City's Green Building Ordinance.

Operation of the proposed project would not result in an increase in GHG emissions because operation- and maintenance-related activities would be, in effect, unchanged compared with those under existing conditions. Following construction of the replacement dam, the office, vehicle maintenance, and other structures that would be built to accommodate contractor and personnel during project construction would be removed. The number of personnel serving on-site during construction would be reduced to the small number that currently operate and maintain the facilities. Thus, operation-related activities would not result in a discernible change in emissions in comparison to existing conditions.

Given the small amount of GHGs that would be emitted from the proposed project during construction, continuing implementation of GHG reduction actions by the City and County of San Francisco and SFPUC, additional GHG reduction actions that the SFPUC would implement as part of the WSIP (see Subsection 4.13.1.2, Regulatory Framework, above), and the lack of change between existing and future operation-related activities, the proposed project would not conflict

with the state's goals of reducing GHG emissions to 1990 levels by 2020, or the City's GHG reduction goals established in the Greenhouse Gas Reduction Ordinance.

Impact Conclusion

With respect to GHG emissions, construction-related activities would result in small short-term project-generated increases. Operation-related activities would not result in a significant change in emissions in comparison to existing conditions. Thus, project-generated GHG emissions would also not conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (i.e., the project's GHG emissions would not make a substantial contribution to global climate change). This would be a less-than-significant impact.

As discussed above, the BAAQMD is considering the future adoption of quantitative CEQA thresholds of significance for construction-related air quality impacts. At present, two options are under consideration for construction-related GHG emission thresholds (BAAQMD 2009). Option 1 is based on the total construction-related CO₂e emissions over the duration of project construction. Under this option, a project would have a significant impact if its total emissions of CO₂e over the duration of construction exceed 35,250 metric tons (MT). Option 2 under consideration is based on daily construction emissions of CO₂e. Under this option, a project would have a significant impact if daily construction emissions exceed 10 MT per day. In anticipation of the future implementation of proposed new BAAQMD CEQA thresholds of significance for GHG emissions, this EIR provides an analysis of the project's construction GHG emissions under each of the proposed thresholds of significance identified above.

Based on the worst-case analysis above, construction-related GHG emissions were calculated to be approximately 21 MT per day CO₂e and 24,012 MT CO₂e over the duration of construction (a maximum of 6,003 MT CO₂e per year multiplied by the 4-year construction schedule). Actual emissions would not reach worst-case levels on a daily basis; therefore, total emissions would likely be much less than 24,012 MT CO₂e over the duration of the project. Nevertheless, even under this worst-case scenario, emissions would not exceed 35,250 MT CO₂e. Therefore, project emissions would not be anticipated to exceed the total construction emissions threshold of 35,250 MT CO₂e under the proposed threshold Option 1; however, the project would be likely to exceed the daily threshold of 10 MT CO₂e under threshold Option 2. Implementation of the BAAQMD exhaust and diesel PM controls identified in Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would reduce project-related GHG emissions. The exact reduction percentage cannot be calculated at this time; however, even with these reductions, construction-related emissions of GHG would likely still exceed the draft daily threshold of significance of 10 MT per day CO₂e. No other feasible mitigation exists that would reduce construction-related emissions of GHG to below the BAAQMD draft daily threshold of significance. Therefore, construction-related emissions of GHG would have potentially significant and unavoidable impacts on climate change in accordance with the proposed Option 2 BAAQMD threshold of significance.

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4.14 NOISE AND VIBRATION

Section 4.14 Contents	
4.14.1 Setting	4.14.2 Impacts
4.14.1.1 Noise Descriptors	4.14.2.1 Significance Criteria
4.14.1.2 Existing Noise Environment	4.14.2.2 Approach to Analysis
4.14.1.3 Vibration	4.14.2.3 Project Impacts
4.14.1.4 Regulatory Framework	

This section focuses on evaluating the effects of constructing and operating the proposed replacement dam on the existing ambient noise environment and sensitive receptors. It describes existing noise conditions, presents applicable noise regulations, identifies sensitive noise receptors that could be affected by the project, and evaluates the potential effects of project construction and operation on these receptors.

4.14.1 SETTING

4.14.1.1 NOISE DESCRIPTORS

Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound. The decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over 1 million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness, a 5-dBA increase is a readily noticeable change, and a 3-dBA increase is barely noticeable to most people. The noise levels presented herein are expressed in terms of dBA unless otherwise indicated. Table 4.14.1 shows some representative noise sources and their corresponding noise levels in dBA.

Table 4.14.1: Typical Sound Levels Measured in the Environment

Examples of Common, Easily Recognized Sounds	Decibels (dBA)	Subjective Evaluations
Near Jet Engine	140	Deafening
Threshold of Pain	130	
Threshold of Feeling – Hard Rock Band	120	
Accelerating Motorcycle (at a few feet away)	110	
Loud Horn (at 10 feet away)	100	Very Loud
Noisy Urban Street	90	
Noisy Factory	85 ¹	
School Cafeteria with Untreated Surfaces	80	Loud
Lawn Mower	70 ²	
Near Freeway Auto Traffic	60 ²	Moderate
Average Office	50 ²	
Soft Radio Music in Apartment	40	Faint
Average Residence Without Stereo Playing	30	
Average Whisper	20	Very Faint
Rustle of Leaves in Wind	10	
Human Breathing	5	
Threshold of Audibility	0	
<i>Notes:</i> ¹ Continuous exposure above 85 dBA is likely to degrade the hearing of most people. ² Range of speech is 50 to 70 dBA.		

Source: U.S. Department of Housing and Urban Development 1985

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called L_{eq}) that represents the acoustical energy of a given measurement. $L_{eq}(24)$ is the steady-state energy level measured over a 24-hour period. L_{10} is the noise level that is exceeded 10 percent of the measurement period. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that, for planning purposes, an artificial dBA increment be added to quiet-time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds 5 dBA during the evening hours (7 p.m. to 10 p.m.) and 10 dBA during the night hours (10 p.m. to 7 a.m.). Another 24-hour noise descriptor, called the day-night noise level (L_{dn}), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10 p.m. and 7 a.m., L_{dn} does not add the evening 5-dBA penalty. In practice, L_{dn} and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

4.14.1.2 EXISTING NOISE ENVIRONMENT

Subsection 4.14.1.2 Contents

Existing Noise Levels
Sensitive Receptors

Calaveras Dam is located in Alameda County, but the area affected by project construction spans two counties: Alameda County and Santa Clara County. This area is mostly undeveloped with few sources of noise and few noise-sensitive receptors.

Existing Noise Levels

The primary sources of noise in the project area include local traffic on Calaveras Road as well as quarry and nursery operations. There are no freeways in the project vicinity, although the I-680 freeway is located approximately 6 miles north of the existing Calaveras Dam near Sunol and approximately 4 miles west of the Calaveras Reservoir in Milpitas.

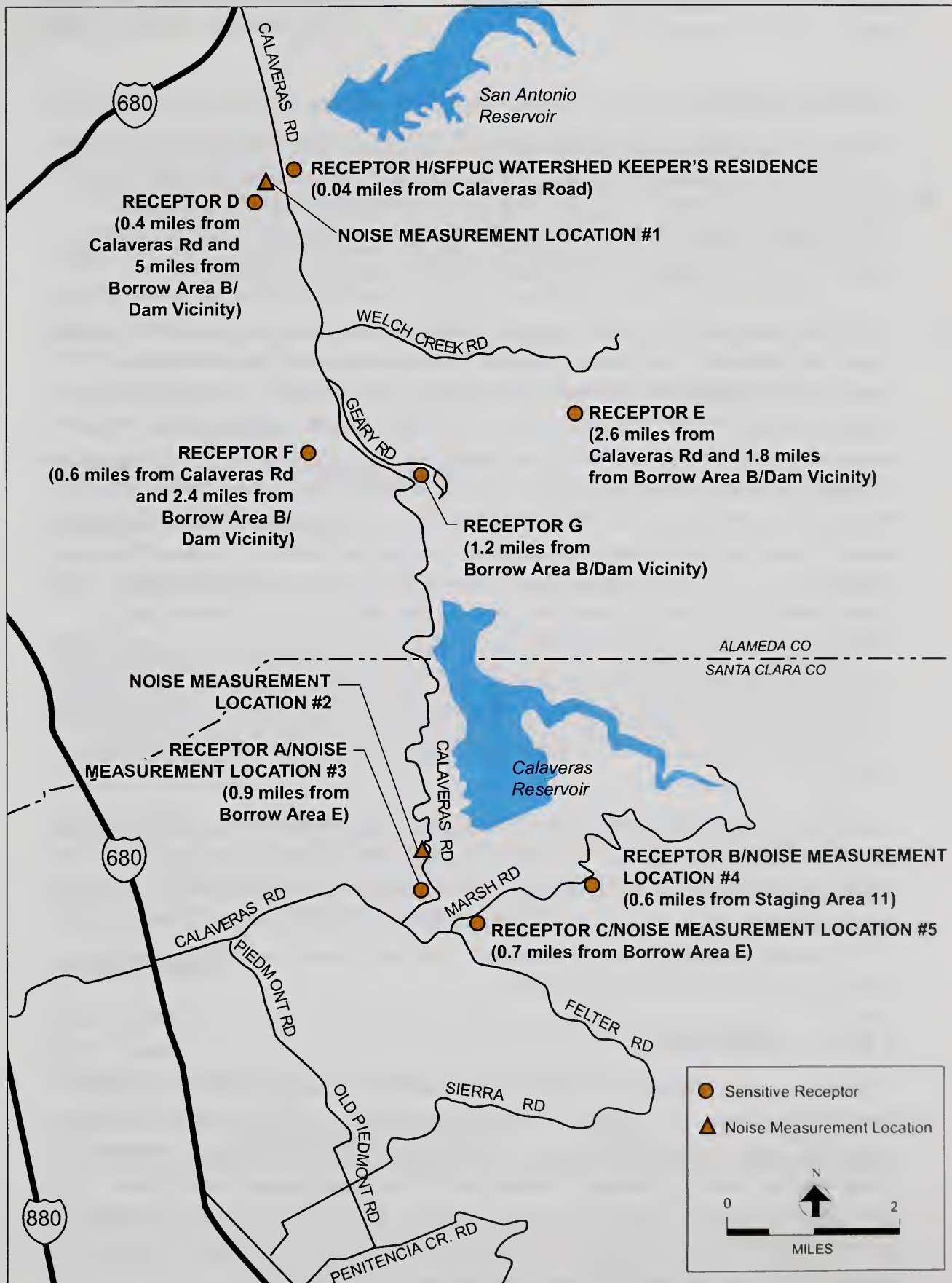
In order to characterize the current noise environment in the project area, noise measurements were taken on January 18 and 19, 2007, near the southern portion of the Calaveras Reservoir (approximately 3 miles south of the dam) and in the Sunol Valley in the vicinity of the San Antonio Pump Station (approximately 5 miles northwest of the dam). These measurements are presented in Table 4.14.2 and their locations are indicated in Figure 4.14.1, Noise Measurement and Sensitive Receptor Locations. Because residential uses are the most noise-sensitive uses in the project area, measurement locations were selected to characterize the ambient noise environments at residential receptors located closest to areas that would be affected by project-related construction activities (haul trucks on local access roads or grading activities in the vicinities of the dam and borrow areas).

Measurements indicate that the one residence located approximately 2,000 feet west-northwest of the San Antonio Pump Station and Calaveras Road in the Sunol Valley (Location #1 on Figure 4.14.1) is subject to noise levels of approximately 50 to 53 dBA (L_{dn}), while residences to the south of Calaveras Dam (east of Felter Road and north/west of Calaveras Road, approximately 3 or more miles south of Calaveras Dam; Locations #2 through #5 on Figure 4.14.1) are subject to noise levels of approximately 44 to 48 dBA (L_{dn}) at residences (set back from the road) and up to 55 dBA adjacent to Calaveras Road. The primary source of noise at these five locations is traffic on Calaveras Road.

Table 4.14.2: Summary of Noise Measurement Results

Time	Noise Level Measurements (dBA)				
	Location 1 ¹ (Sunol Valley, West of San Antonio Pump Station)	Location 2 ² (Calaveras Reservoir Adjacent to Calaveras Road)	Location 3 ³ Receptor A (4010 Calaveras Road)	Location 4 ³ Receptor B (End of Calaveras Road)	Location 5 ³ Receptor C (4829 Felter Road)
Day L _{eq} (7 a.m.–7 p.m.)	49	48/45	46	48	43
Evening L _{eq} (7 p.m.–10 p.m.)	46	61/40	39	43	38
Night L _{eq} (10 p.m.–7 a.m.)	46	44/36	40	34	35
L_{dn}	53	55/45	48	47	44
<i>Notes:</i> Measurements at Locations 1 and 2 were taken from noon on Thursday, January 18 to noon on Friday, January 19, 2007, using Quest SoundPro DL Type II digital sound level meters at Locations 1 and 2 (see Figure 4.14.1). Measurements at Locations 3, 4, and 5 were taken from noon on Thursday, December 11 to noon on Friday, December 12, 2008, using standard ANSI Type I noise meters (Norsonic N-140). ¹ Location 1 was approximately 1,000 feet west of Calaveras Road. ² Location 2 was approximately 25 feet south of Calaveras Road. Noise measurement results indicate various vehicle-related activities, particularly during the evening and nighttime hours (vehicles could pull off the road onto a wide shoulder at this location). The first number indicates the actual measurements (which include noise levels from these activities), while the second number reflects the noise level when peak noise levels from these activities have been removed. Since there are no sources of noise in this vicinity, the lower noise level reflects the noise environment in areas away from Calaveras Road while the higher noise level reflects the noise environment adjacent to this road. ³ Location 3 was on the residential property at 4010 Calaveras Road, Receptor A. ⁴ Location 4 was at the residential property boundary on Marsh Road (no house number), Receptor B. ⁵ Location 5 was on the residential property at 4829 Felter Road, Receptor C.					

Sources: ETJV 2007; VACC 2008



SOURCE: EDAW&Turnstone JV

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FIGURE 4.14.1: NOISE MEASUREMENT AND SENSITIVE RECEPTOR LOCATIONS

Sensitive Receptors

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land use type. Some general guidelines (USEPA 1974) are as follows: sleep disturbance may occur at levels above 35 dBA, interference with human speech begins at around 60 dBA, and hearing damage may result from prolonged exposure to noise levels in excess of 85 to 90 dBA.

Certain land uses, such as residences, schools, childcare centers, churches, hospitals, and nursing homes, are considered to be sensitive receptors. No schools, childcare centers, churches, hospitals, or nursing homes are located in the vicinity of Calaveras Dam. There are two San Francisco Public Utilities Commission (SFPUC) watershed keeper's residences located in the project area. One residence is located approximately one-third mile south of the existing dam and the other residence is located approximately 5 miles to the north in the Sunol Valley (about 225 feet east of Calaveras Road, near Alameda East Portal). The closest private residential receptors include several residences located approximately 3 or more miles south of Calaveras Dam (Receptors A, B, and C off Calaveras Road and Felter Road); several residences located approximately 1.5 to 3 miles to the north of the dam (Receptor E, east of Calaveras Road off Welch Creek Road; Receptor F, west of Calaveras Road, north of Leyden Creek; and Receptor G, located at the East Bay Regional Park District's (EBRPD) visitor center north of the dam site); and one residence located approximately 5 miles north of the dam (Receptor D, about one-fourth mile southeast of Alameda West Portal and one-third mile southwest of San Antonio Pump Station).

Natural recreation areas typically require some degree of quiet for passive recreational uses and can be considered noise-sensitive. The Sunol and Ohlone Wilderness Regional Preserves are located north of the dam, while the Mission Peak Regional Preserve extends along both sides of a ridge located west of Calaveras Reservoir and Calaveras Road. Recreationists, as well as certain wildlife species in this area, could be sensitive to construction noise, particularly impulse or percussive noises like pile driving or blasting.

4.14.1.3 VIBRATION

Vibration caused by construction activities can be interpreted as energy transmitted in waves through the soil mass. These energy waves generally dissipate with distance from the vibration source (e.g., controlled detonations or pile driving). Since energy is lost during the transfer of energy from one particle to another, vibration that is distant from a source is usually less perceptible than vibration closer to the source. However, actual human and structure response to different vibration levels is influenced by a combination of factors, including soil type, distance between source and receptor, duration, and the number of perceived events.

If great enough, the energy transmitted through the ground as vibration can result in structural damage. To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec). A freight train passing at a distance of 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibrations in the range of 10 in/sec PPV. In general, cosmetic or threshold damage to residential buildings can occur at peak particle velocities over 0.5 in/sec. The term “threshold damage vibration” is defined as the highest vibration amplitude at which no cosmetic, minor, or major damage occurs; this includes “threshold cracks” or “hair-sized” cracks in room walls that occur at the lowest vibration amplitudes (Wilson Ihrig & Associates 2005).

4.14.1.4 REGULATORY FRAMEWORK

Subsection 4.14.1.4 Contents
Alameda County
Santa Clara County

Calaveras Dam is located within the SFPUC-owned Alameda Watershed lands. Calaveras Reservoir spans the unincorporated areas of both Alameda and Santa Clara Counties. Noise ordinances of Alameda and Santa Clara Counties regulate noise sources, such as mechanical equipment and amplified sounds, as well as prescribe hours of heavy equipment operation and construction activities. In most cases, noise ordinances are part of local building and zoning ordinances of other jurisdictions, and building and zoning ordinances do not apply to SFPUC projects (pursuant to California Government Code 53090, *et seq.*). However, time and noise limits prescribed in local noise ordinances are taken into consideration in determining whether the project would have a significant noise effect under CEQA.

Alameda County

Table 6.60.040A in Section 6.60.040 of the Alameda County General Code (Title 6, Health and Safety, Chapter 6.60) specifies the following exterior noise level standards at receiving single- or multiple-family residential, school, hospital, church, and public library uses:

Category	Cumulative Number of Minutes in any one-hour time period	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
1	30	50 dBA	45 dBA
2	15	55 dBA	50 dBA
3	5	60 dBA	55 dBA
4	1	65 dBA	60 dBA
5	0	70 dBA	65 dBA

When these noise and duration noise limits are applied, the maximum theoretical noise limit for any given one-hour time period would be 58 dBA (L_{eq}) during the day and evening (7 a.m. to 10 p.m.) and 53 dBA (L_{eq}) at night (10 p.m. to 7 a.m.). This section of the code also specifies that the applicable standard shall be adjusted to be equal to the ambient noise level in the event the measured ambient noise level exceeds the applicable noise level standard in any category above. The above noise level standards are required to be reduced by 5 dBA for recurring impulsive noises such as pile driving.

Section 6.60.070(E) specifies the following hourly limits for construction: 7 a.m. to 7 p.m. on weekdays and 8 a.m. to 5 p.m. on Saturdays and Sundays.

Section 6.60.050 limits vibration to the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty (150) feet from the source if on a public space or public right-of-way.

Santa Clara County

Table B11-152 of Section B11-152 of the Santa Clara County Code specifies the following exterior noise level standards at receiving one- and two-family residential uses:

Category	Cumulative Number of Minutes in any one-hour time period	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
a	30	55 dBA	45 dBA
b	15	60 dBA	50 dBA
c	5	65 dBA	55 dBA
d	1	70 dBA	60 dBA
e	0	75 dBA	65 dBA

These noise and duration noise limits result in a converted L_{eq} noise limit equivalent of 63 dBA (L_{eq}) between 7 a.m. and 10 p.m. and 53 dBA (L_{eq}) from 10 p.m. to 7 a.m. This section of the code also specifies that if the measured ambient noise level exceeds that permissible within any of the first four noise limit categories above, the allowable noise exposure standard will be increased in 5 dB increments in each category as appropriate to encompass or reflect the ambient noise level. In the event the ambient noise levels exceed noise limit category “e,” the maximum allowable noise level under the category will be increased to reflect the maximum ambient noise level. Also, if the alleged offensive noise contains a steady audible tone (i.e., a whine, screech or hum), the above standard limits set forth will be reduced by 5 dB.

Section B11-154(6)(a) prohibits operation of any tools or equipment used in construction between 7:00 p.m. and 7:00 a.m. on weekdays and Saturdays, or at any time on Sundays or holidays. This section also specifies the following construction noise limits in areas zoned for single-family residential uses and where technically and economically feasible:

	Maximum noise levels for nonscheduled, intermittent, short-term operation (less than ten days) of mobile equipment	Maximum noise levels for repetitively scheduled and relatively long-term operation (periods of ten days or more) of stationary equipment
Daily, except Sundays and legal holidays 7:00 a.m.--7:00 p.m.	75 dBA	60 dBA
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50 dBA	50 dBA

Section 6.60.050 limits vibration to the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty (150) feet from the source if on a public space or public right-of-way.

4.14.2 IMPACTS

4.14.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to noise, but generally considers that implementation of the project would have a significant impact if it were to:

- Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies;
- Expose people to or generate excessive ground-borne vibration or ground-borne noise levels;
- Create a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- Create a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- For a project located within an area covered by an airport land use plan (or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport), expose people residing or working in the project area to excessive noise levels;
- For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels; or
- Be substantially affected by existing noise levels.

The two airport-related criteria were considered in this analysis, but were not found to be applicable to this project, since this project would be not be located near any public airports or private airstrips. The San Jose International Airport is located approximately 10 miles south of Calaveras Dam.

The last criterion, “be substantially affected by existing noise levels,” is not applicable to this project because the proposed facility is not a noise-sensitive use.

4.14.2.2 APPROACH TO ANALYSIS

This analysis evaluates noise impacts that could result from proposed activities that would occur during project construction (e.g., general construction, construction traffic noise, blasting, and vibration). For construction noise, the potential for impact is defined by the proximity of sensitive receptors, typical noise levels associated with construction equipment, the potential for construction noise levels to interfere with daytime and nighttime activities, and whether construction noise audible to nearby receptors will occur outside of construction time limits specified in local ordinances. Another relevant factor to consider in assessing whether a noise impact is significant or not is the frequency with which noise levels associated with project construction might exceed the established standards. If exceedance of a noise standard might happen only very rarely and/or briefly, this may not constitute a significant impact.

4.14.2.3 PROJECT IMPACTS

Table 4.14.3 summarizes the project-related impacts on noise and vibration described in this section.

Table 4.14.3: Summary of Noise and Vibration Impacts

Impact	Level of Significance
4.14.1: Disturbance from temporary construction-related noise increases.	SU
4.14.2: Temporary noise disturbance along construction haul routes.	LSM
4.14.3: Disturbance due to construction-related controlled blasting.	LSM
4.14.4: Disturbance due to construction-related vibration.	LS
4.14.5: Disturbance due to long-term noise increases associated with operation of project facilities.	LS
<i>Notes:</i> SU – Significant and Unavoidable LS – Less than significant LSM – Less than significant with mitigation	

Construction Impacts

Impact 4.14.1: Disturbance from temporary construction-related noise increases.

Construction activities associated with project implementation would result in temporary noise increases at distant sensitive receptors to the north and south of the project area. During construction, noise levels would fluctuate at any given receptor depending on construction phasing, equipment type/duration of use, distance between the noise source and receptor, and the presence or absence of barriers between the noise source and receptor. Typical construction equipment generates noise levels ranging from about 76 to 88 dBA at a distance of 50 feet from the source, with slightly higher levels of about 88 to 91 dBA for certain types of earthmoving and impact equipment. Noise associated with pile driving would be limited since pile driving is not

likely to be necessary for this project, except as identified below. The rate of attenuation is about 6 dBA for every doubling of distance from a point source. Table 4.14.4 indicates noise levels at 50 and 100 feet from the noise source for typical construction equipment.

Table 4.14.4: Noise Levels and Abatement Potential of Construction Equipment Noise at 50 and 100 Feet (in dBA)

Equipment	Noise Level at 50 Feet		Noise Level at 100 Feet	
	Without Controls ¹	With Controls ¹	Without Controls ¹	With Controls ¹
Earthmoving				
Front Loaders	79	75	73	69
Backhoes	85	75	79	69
Dozers	80	75	74	69
Tractors	80	75	74	69
Graders	85	75	79	69
Trucks	91 ²	75	85	69
Materials Handling				
Concrete Mixers	85	75	79	69
Concrete Pumps	82	75	76	69
Cranes	83	75	77	69
Derricks	88	75	82	69
Stationary				
Pumps	76	75	70	69
Generators	78	75	72	69
Compressors	81	75	75	69
Impact				
Rock Drills	98	80	92	74
Jack Hammers	88	75	82	69
Pneumatic Tools	86	80	80	74
Pile Driver	101	95	95	89
Other				
Saws	78	75	72	69
Vibrators	76	75	70	69
<i>Notes:</i> ¹ Estimated levels can be obtained by selecting quieter procedures or machines and implementing noise-control features that do not require major redesign or extreme cost (e.g., improved mufflers, equipment redesign, use of silencers, shields, shrouds, ducts, and engine enclosures). ² This noise level represents the maximum noise level (Lmax) associated with a single passing truck.				

Source: USEPA 1971

If the barge hauling option to transport materials from Borrow Area E to the dam construction site is selected, pile driving could be used to install piers supporting a dock at the southern end of the reservoir.

As stated in the first significance criterion above, a noise impact is considered significant if noise levels are in excess of the standards established in local noise ordinances. This analysis compares proposed hours of construction with time limits specified in local noise ordinances. The vicinity of the new dam site, Staging Area 11, and haul route location north of the dam are in Alameda County; Borrow Area E and a portion of Disposal Site 7 would be located in Santa Clara County. Residential receptors (Receptors A, B, and C; see Figure 4.14.1) near Borrow Area E are located in Santa Clara County, while the residential receptors in the Sunol Valley (Receptors D, E, F, G, and H; see Figure 4.14.1) are located in Alameda County. Since noise limits within a zoning district generally apply to the operation of stationary equipment and not construction, these limits are only used as a threshold where construction is proposed to occur beyond the ordinance time limits (nighttime construction) or if the construction duration is long (many months or years). If construction were to occur during the night, ordinance nighttime noise limits would protect sensitive receptors from sleep interference. The Santa Clara County Noise Ordinance limits nighttime noise (10 p.m. to 7 a.m.) to 50 dBA, or 53 dBA (L_{eq}) for stationary equipment. The Alameda County Noise Ordinance limits nighttime noise to 53 dBA (L_{eq}).

For construction noise, a “substantial” noise increase (as stated in the fourth significance criterion) can be defined as interference with activities during the day and night. One indicator that construction noise could interfere with daytime activities would be speech interference. An indicator that construction noise could interfere with nighttime activities would be sleep interference. This analysis uses the following criteria to define the significance of estimated noise increases:

- **Speech Interference.** Speech interference is an indicator of an impact on typical daytime and evening activities. A speech interference criterion, in the context of impact duration and time of day, is used to identify substantial increases in noise from temporary construction activities. Noise peaks generated by construction equipment could result in speech interference in adjacent buildings if the noise level in the interior of the building exceeds 45 to 60 dBA.¹ A typical building can reduce noise levels by 25 dBA with the windows closed (USEPA 1974). This noise reduction could be maintained only temporarily in some cases, since it assumes windows must remain closed at all times. Assuming a 25-dBA reduction with the windows closed, an exterior noise level of 70 dBA (L_{eq}) at receptors would maintain an acceptable interior noise environment of 45 dBA. Such noise levels would be sporadic rather than continuous in nature, because different types of construction equipment would be used throughout the construction process.
- **Sleep Interference.** Based on available sleep criteria data, an interior nighttime level of 35 dBA is considered acceptable (USEPA 1974). Assuming a 25-dBA reduction with the

¹ For indoor noise environments, the highest noise level that permits relaxed conversation with 100 percent intelligibility throughout the room is 45 dBA. Speech interference is considered to become intolerable when normal conversation is precluded at 3 feet, which occurs when background noise levels exceed 60 dBA. For outdoor environments, the highest noise level that permits normal conversation at 3 feet with 95 percent sentence intelligibility is 66 dBA (USEPA 1974).

windows closed, an exterior noise level of 60 dBA at receptors would maintain an acceptable interior noise environment of 35 dBA. Since a 15-dBA reduction would occur with windows open, an exterior noise level of 50 dBA (L_{eq}) would be required to maintain an acceptable interior noise environment of 35 dBA.

To address potential noise conflicts that can arise, local noise ordinances typically restrict construction activities to the daytime working hours and specify noise limits for operation of any equipment (typically stationary equipment) during the nighttime hours.

When typical noise levels for various pieces of construction equipment (presented in Table 4.14.4) are consolidated and applied to the closest residential receptor locations, worst-case temporary noise increases due to the project can be estimated. Estimated maximum construction noise levels are presented at the receptors located closest to various project components in Tables 4.14.5 and 4.14.6 (identified as “adjusted L_{eq} ”). Maximum noise levels listed in this table are intended to depict worst-case conditions at the closest receptors; noise levels would vary at each receptor during construction, with the highest noise levels occurring during heavy equipment operation in proximity to the closest receptors. Noise level estimates at residential receptors may be conservatively high, since they assume simultaneous operation of all identified equipment for 30 minutes of any given hour and they do not account for the noise attenuation effects of existing topography. Hills located between the source and receptors can perform like noise barriers wherever they interrupt direct lines-of-sight, and can help to reduce noise levels at receptors.

Project facilities that have the greatest potential to affect the closest identified sensitive receptors are described below.

Dam Vicinity (Including Dam Site, Borrow Area B, Disposal Sites 2 and 3)

Construction in this area is proposed to occur 20 hours per day (consisting of two 10-hour shifts per day), 6 days per week. Most construction activities would occur for approximately 2 to 3 years. The proposed 20-hour-per-day construction would not be consistent with the time limits specified in the Alameda County Noise Ordinance (7 a.m. to 7 p.m. on weekdays, 8 a.m. to 5 p.m. on Saturdays and Sundays) and Santa Clara County Noise Ordinance (7 a.m. to 7 p.m. on weekdays and Saturdays). Since construction activities would extend beyond these hours, ordinance noise limits that apply to operation of any equipment are used to assess the significance of project-related noise increases.

There is an existing SFPUC watershed keeper's residence located approximately 1,200 feet south of the existing dam, but this residence is proposed to be vacant during project construction. Therefore, this residential receptor would not be affected by dam construction.

Table 4.14.5: Estimated Daytime Construction Noise Levels at the Closest Sensitive Receptors and Consistency with Significance Criteria

Project Component and Receptor Proximity	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet (a)	Distance Between Closest Project Facility & Receptor (b)	Distance Adjustment	Adjusted Leq	Measured Daytime Ambient Noise Level	Unmitigated Leq Exceeds Ambient?	Noise Ordinance Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Engine Controls (c)	Mitigated Leq with Engine Controls	Mitigated Leq Exceeds Ambient?	Mitigated Leq Exceeds Limit?
Borrow Area E, Receptor A (Closest residential receptor to the west is located on Calaveras Road, approximately 4,800 feet from borrow area)	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader) Trucks (11) Articulated Trucks, 1 Water Truck Stationary Equipment (4 Generators)	90 97 87	4,800 4,800 4,800	-57 -57 -57	33 40 30	46 46 46	No No No	63 63 60	No No No	-10 -16 -3	23 24 27	N/A N/A N/A	No No No
Borrow Area E, West Haul Route, Receptor A (Closest residential receptor to the west is located 3,600 feet from West Haul Route)	Haul Trucks (Max. 25 Trucks Per Hour)	64	3,600	-31	33	46	No	63	No	0	33	N/A	No
Worst-Case Combined Noise Level (d)		98			42	46	No	63	No		35	No	No
Borrow Area E/Staging Area 11, Receptor B (Closest residential receptor to the east is located on Marsh Road, approximately 3,000 feet from staging area)	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader) Trucks (11) Articulated Trucks, 1 Water Truck Stationary Equipment (4 Generators)	90 97 87	3,000 3,000 3,000	-46 -46 -46	44 51 41	48 48 48	No Yes No	63 63 60	No No No	-10 -16 -3	34 35 38	No No No	No No No
Worst-Case Combined Noise Level (d)		98			52	48	Yes	63	No		40	No	No
Borrow Area E, Receptor C (Closest residential receptor is located on Marsh Road, as close as approximately 3,900 feet from borrow area)	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader) Trucks (11) Articulated Trucks, 1 Water Truck Stationary Equipment (4 Generators)	90 97 87	3,900 3,900 3,900	-52 -52 -52	38 45 35	43 43 43	No Yes No	63 63 60	No No No	-10 -16 -3	28 29 32	No No No	No No No
Worst-Case Combined Noise Level (d)		98			46	43	Yes	63	No		34	No	No
Off-site Truck Traffic on Calaveras Road (South of I-680), Receptors D and H (Closest residential receptors are 2,000 feet to the west (D) and 225 feet to the east (H) of this road)	Haul Trucks (Existing Vehicle and Truck Traffic Plus Maximum of 83 Worker Vehicles and 26 Truck Trips Per Hour Due to Project) Haul Trucks (Existing Vehicle and Truck Traffic Plus Maximum of 83 Worker Vehicles and 26 Truck Trips Per Hour Due to Project)	66 66	225 2,000	-10 -25	56 41	49 49	Yes No	63 63	No No	-5 0	51 41	Yes No	No No
Barge Haul Option Southern Jetty for Barges, Receptor B (Closest residential receptor is located 6,700 feet southeast of the jetty at the south end of the reservoir) (e)	Up of Two Tugs Per Barge Electric Dredge Pile Driving Leq Lmax	82 72 77 85	6,700 6,700 6,700 6,700	-63 -63 -63 -63	19 9 14 22	48 48 48 48	No No No No	63 63 63 60/65	No No No No	0 0 0 0	19 9 14 22	No No No No	No No No No

(continued)

Table 4.14.5: (continued)

Project Component and Receptor Proximity	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet (a)	Distance Between Closest Project Facility & Receptor (b)	Distance Adjustment	Adjusted Leq	Measured Daytime Ambient Noise Level		Unmitigated Leq Exceeds Ambient?	Noise Ordinance Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Engine Controls (c)	Mitigated Leq with Engine Controls	Mitigated Leq Exceeds Ambient?	Mitigated Leq Exceeds Limit?
						Noise Level	Ambient							
Barge Haul Option North Landing for Barges, Receptor F (Closest residential receptor is located 12,100 feet northwest of landing at the north end of the reservoir) (c)	Up of Two Tugs	82	12,100	-76	6	48	No	No	63	No	0	6	No	No
	Per Barge Electric Dredge	72	12,100	-76	-4	48	No	No	63	No	0	-4	No	No
Controlled Blasting, Receptor G (Closest receptor is EBRPD caretaker's residence located in Sunol Regional Wilderness at end of Geary Road, approximately 6,300 feet north of Borrow Area B)	Pile Driving Leq	77	12,100	-76	1	48	No	No	63	No	0	1	No	No
	Lmax	85	12,100	-76	9	48	No	No	60/65	No	0	9	No	No
Controlled Blasting, Receptor A Residences South of Reservoir (Closest residential receptor is located 16,800 feet to the south)	Blasting Lmax	131	6,300	-42	89	45	Yes	Yes	70	Yes	0	89	Yes	Yes
	Blasting Lmax	131	16,800	-51	80	46	Yes	Yes	70	Yes	0	80	Yes	Yes

Notes:

- Reference noise levels represent the highest noise level for earthmoving equipment and impact equipment (without controls) listed in Table 4.14.4 at 50 feet. The reference noise levels for trucks are based on hourly truck volumes estimated for the specified haul route and are proposed to occur 10 hours per day on weekdays (7 a.m. to 5 p.m.).
- The distances represent the minimum distances between the identified receptor and Borrow Area E and the two alternative haul routes, West Haul Road or Calaveras Road.
- Noise control reductions represent the difference between the highest noise levels listed in Table 4.14.4 with engine controls versus without controls.
- These noise levels represent the worst-case combined noise level that could occur from simultaneous operation of maximum number of heavy equipment identified and assumes all earthmoving equipment is operated 30 minutes of each hour at full throttle and articulated trucks are operated 30 minutes of each hour at full throttle.
- To evaluate worst-case conditions, it is conservatively assumed that two tugs (one barge) would generate noise within 6,700 feet of the closest residences 100 percent of the time, day and night.

Table 4.14.6: Estimated Nighttime Construction Noise Levels at the Closest Sensitive Receptors and Consistency with Significance Criteria

Project Component and Receptor Proximity	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet (a)	Distance Between Closest Project Facility & Receptor (b)	Distance Adjustment	Adjusted Leq	Measured Nighttime Ambient Noise Level	Unmitigated Leq Exceeds Ambient?	Noise Ordinance Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Engine Controls (c)	Mitigated Leq with Engine Controls	Mitigated Leq Exceeds Ambient?	Mitigated Leq Exceeds Limit?
Dam Area, Receptor G	Earthmoving Equipment (6 Bulldozers, 1 Backhoe, 7 Loaders, 2 Excavators, 2 Vibrating Grizzlies)	95	6,300	-69	26	36	No	53	No	Not Required	N/A	N/A	N/A
Caretaker's residence located in Sunol Regional Wilderness at end of Geary Road, approximately 6,300 feet north of Borrow Area B	22 Articulated Trucks, 1 Water Truck	100	6,300	-69	31	36	No	53	No	Not Required	N/A	N/A	N/A
	Stationary Equipment (1 Grout Batch Plant, 6 Air Compressors, 2 Dewatering Pumps, 1 Ventilation Fan)	95	6,300	-69	26	36	No	50	No	Not Required	N/A	N/A	N/A
Worst-Case Combined Noise Level (d)													
Disposal Area 7, Receptor B	Earthmoving Equipment (2 Bulldozers, 1 Motorgrader)	87	13,400	-84	3	34	No	53	No	Not Required	N/A	N/A	N/A
(Closest residential receptor to the south is located on Marsh Road, approximately 13,400 feet from disposal area)	Trucks (1 Water Truck)	86	13,400	-84	2	34	No	53	No	Not Required	N/A	N/A	N/A
	Stationary Equipment (4 Generators)	86	13,400	-84	2	34	No	50	No	Not Required	N/A	N/A	N/A
Haul Route, Receptor B	Haul Trucks (Max. 10 Trucks Per Hour)	60	13,400	-59	1	34	No	53	No	Not Required	N/A	N/A	N/A
Worst-Case Combined Noise Level (d)													
Borrow Area E, Receptor A	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader)	91	4,800	-57	8	34	No	53	No	-10	N/A	N/A	N/A
(Closest residential receptor to the west is located on Calaveras Road, approximately 4,800 feet from borrow area)	Trucks (11 Articulated Trucks, 1 Water Truck)	97	4,800	-57	40	40	No	53	No	-16	24	No	No
	Stationary Equipment (4 Generators)	87	4,800	-57	30	40	No	50	No	-3	27	No	No
Borrow Area E West Haul Route, Receptor A	Haul Trucks	64	3,600	-31	33	40	No	53	No	0	33	No	No
(Closest residential receptor to the west is located 3,600 feet from West Haul Route)	25 Trucks/Hour (Maximum)	60	3,600	-31	29	40	No	53	No	0	29	No	No
	(Average)	98			42	40	Yes	53	No		35	No	No
Worst-Case Combined Noise Level (d)													
Borrow Area E/Staging Area 11, Receptor B (Closest residential receptor to the east is located on Marsh Road, approximately 3,000 feet from staging area)	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader)	90	3,000	-46	44	34	Yes	53	No	-10	34	No	No
	Trucks (11 Articulated Trucks, 1 Water Truck)	97	3,000	-46	51	34	Yes	53	No	-16	35	Yes	No
	Stationary Equipment (4 Generators)	87	3,000	-46	41	34	Yes	50	No	-3	38	Yes	No
Worst-Case Combined Noise Level (d)		98			52	34	Yes	53	No		40	Yes	No

(continued)

4. Environmental Setting and Impacts
14. Noise and Vibration – Impacts

Table 4.14.6: (Continued)

Project Component and Receptor Proximity	Maximum Noise Source	Reference Hourly Leq in dBA @ 50 feet (a)	Distance Between Closest Project Facility & Receptor (b)	Distance Adjustment	Adjusted Leq	Measured Nighttime Ambient Noise Level	Unmitigated Leq Exceeds Ambient?	Noise Ordinance Limit	Unmitigated Leq Exceeds Limit?	Reduction due to Engine Controls (c)	Mitigated Leq with Engine Controls	Mitigated Leq Exceeds Ambient?	Mitigated Leq Exceeds Limit?
Borrow Area E, Receptor C (Closest residential receptor to the south is located on Marsh Road, as close as approximately 3,900 feet from borrow area)	Earthmoving Equipment (2 Bulldozers, 2 Loaders, 1 Vibrating Grizzly, 1 Motorgrader) Trucks (11 Articulated Trucks, 1 Water Truck)	90 97	3,900 3,900	-52 -52	38 45	35 35	Yes Yes	53 53	No No	-10 -16	28 29	No No	No No
Stationary Equipment (4 Generators)		87	3,900	-52	35	35	No	50	No	-3	32	No	No
Worst-Case Combined Noise Level (d)		98			46	35	Yes	53	No		34	No	No
Off-site Truck Traffic on Calaveras Road (South of I-680), Receptors D and H (Closest residential receptors are 2,000 feet to the west (D) and 225 feet to the east (H) of this road)	Haul Trucks (Existing Vehicle and Truck Traffic Plus Maximum of 83 Worker Vehicles and 26 Truck Trips Per Hour Due to Project)	65	225	-10	55	46	Yes	53	Yes	-5	50	Yes	No
	Haul Trucks (Existing Vehicle and Truck Traffic Plus Maximum of 83 Worker Vehicles and 26 Truck Trips Per Hour Due to Project)	65	2,000	-25	40	46	No	53	No	0	40	No	No
Barge Haul Option Southern Jetty for Barges, Receptor B (Closest residential receptor is located 6,700 feet southeast of the jetty at the south end of the reservoir) (e)	Up of Two Tugs Per Barge	82	6,700	-63	19	36	No	53	No	0	19	No	No
Electric Dredge		72	6,700	-63	9	36	No	53	No	0	9	No	No
Barge Haul Option North Landing for Barges, Receptor F (Closest residential receptor is located 12,100 feet northwest of landing at the north end of the reservoir) (e)	Up of Two Tugs Per Barge	82	12,100	-76	6	36	No	53	No	0	6	No	No
Electric Dredge		72	12,100	-76	-4	36	No	53	No	0	-4	No	No

Notes:

- Reference noise levels represent the highest noise level for earthmoving equipment and impact equipment (without controls) listed in Table 4.14.4 at 50 feet. The reference noise levels for trucks are based on hourly truck volumes estimated for the specified haul route and are proposed to occur 20 hours per day on weekdays (between 7 a.m. and 7 a.m.).
- The distances represent the minimum distances between the identified receptor and Disposal Area E, dam vicinity, and the haul route to Disposal Area E, which are the locations where nighttime construction activities would occur that are closest to the identified sensitive receptors.
- Noise control reductions represent the difference between the highest noise levels listed in Table 4.14.4 with engine controls versus without controls.
- These noise levels represent the worst-case combined noise level that could occur from simultaneous operation of maximum number of heavy equipment identified and assumes all earthmoving equipment is operated 30 minutes of each hour at full throttle and articulated trucks are operated 30 minutes of each hour at full throttle.
- To evaluate worst-case conditions, it is conservatively assumed that two tugs (one barge) would generate noise within 6,700 feet of the closest residences 100 percent of the time, day and night.

The next closest sensitive receptor is the EBRPD caretaker's residence, located approximately 1.6 miles north of the dam site, and about 1.2 miles north of Borrow Area B. There are also several private residences located on the other side of Apperson Ridge approximately 2 to 3 miles north of the dam site vicinity, near the end of Welch Creek Road and west of Calaveras Road (south of the Sunol Valley Water Treatment Plant and north of Leydon Creek), while another private residence and an SFPUC land manager's residence are located approximately 5 miles to the north. To evaluate worst-case impacts from construction in this area, maximum noise levels were estimated at the closest of these receptors. In Table 4.14.6 (see Dam Area, Receptor G), estimated noise levels are compared to ambient nighttime noise levels and the applicable nighttime noise limit of the Alameda County Noise Ordinance. This table indicates that construction-related noise levels estimated at Receptors E and F would be well below the measured ambient noise levels measured in the dam and Sunol Valley vicinities. Receptor D and the SFPUC land manager's residence (north of the dam) would not be significantly affected by noise generated by daytime and nighttime construction activities in the dam vicinity because of their 5-mile separation and topography which blocks direct lines-of-sight between the dam and these receptors. Receptors A, B and C, located to the south but farther from the dam site, would be subject to lower project-related noise levels. Estimated noise levels at any of these receptors would not exceed the Alameda or Santa Clara County nighttime noise limits at these residences or any of the other more distant residential receptors. Therefore, noise increases associated with daytime and nighttime construction in the dam vicinity would have a less-than-significant impact.

Hikers in the Sunol and Ohlone Wilderness Regional Preserves could be subject to construction noise on sections of trails with a direct line-of-sight to the dam vicinity. Potential short-term noise impacts would be less than significant, however, because hikers would be subject to this noise for a limited duration (as they pass the dam vicinity) or could utilize other trails to avoid construction noise altogether. Although less than significant, the SFPUC proposes to coordinate with the EBRPD to post informational signs at the trailheads of affected trails so that hikers can choose to use an alternative trail if they wish to avoid construction noise.

Disposal Site 7

Similar to the dam vicinity, construction in this area is proposed to occur 20 hours per day (consisting of two 10-hour shifts per day), 6 days per week. However, this area is closer to the residential receptors in the Calaveras Valley (approximately 2.5 miles from Receptors A and B) than residential receptors to the north on Welch Creek Road (approximately 3 miles from Receptor E). As shown in Table 4.14.6 (see Disposal Site 7, Receptor B), estimated noise levels are compared to ambient nighttime noise levels and the applicable nighttime noise limit of the Santa Clara County Noise Ordinance. This table indicates that construction-related noise levels estimated at Receptor B would be well below the measured ambient noise level in the vicinity of

this residence. Receptor A would be subject to slightly higher noise levels,² while Receptors C and E would be subject to lower project-related noise levels than those listed for Receptor B because they are located farther away. Estimated noise levels would not exceed the Santa Clara County nighttime noise limit at this residence or any of the other more distant residential receptors. Therefore, noise increases associated with daytime and nighttime construction in Disposal Site 7 would have a less-than-significant impact.

Borrow Area E / Staging Area 11

Construction activities at Borrow Area E and Staging Area 11 would have the highest potential to affect residential receptors near Felter and Marsh Roads since Borrow Area E and Staging Area 11 (identified as “Borrow Area E” in the discussion and in Tables 4.14.5 and 4.14.6) would be located at the south end of the reservoir. Construction activities in this area are proposed to occur 20 hours per day (consisting of two 10-hour shifts per day), 6 days per week. Borrow operations would occur during a 9-month construction season (approximately spring through late fall or winter), mostly during the second construction season. In addition, equipment maintenance and repair activities at the staging area would occur at various times 24 hours per day, 7 days per week throughout much of the approximately 4-year construction period.

As shown in Tables 4.14.5 and 4.14.6 (see Borrow Area E, Receptors A, B, and C), estimated noise levels are compared to ambient daytime and nighttime noise levels as well as applicable daytime and nighttime noise limits of the Santa Clara County Noise Ordinance. These tables indicate that construction-related noise levels estimated at all three residential receptors could exceed measured ambient daytime and nighttime noise levels (depending on the extent of simultaneous equipment operation), and construction noise could be audible at these receptors when equipment is operated near borrow area boundaries closest to these receptors. Ambient noise levels could periodically increase by up to 5 dBA during the day and up to 11 dBA during the night. Although such increases could be readily noticeable, these increases would not be considered significant since they would not cause speech or sleep interference effects except possibly at Receptor B (combined construction noise levels in Tables 4.14.5 and 4.14.6 would not exceed the 70-dBA speech interference or 50-dBA sleep interference criteria) nor would the daytime and nighttime noise ordinance limits be exceeded at any receptors.

Simultaneous operation of heavy equipment and trucks at night along the eastern boundary of Staging Area 11 could periodically result in sleep interference effects at Receptor B (exceeding the 50-dBA sleep interference criterion by 1 or 2 dBA as shown in Table 4.14.6); this sleep interference would be considered a potentially significant impact. These estimated noise levels are conservative since they assume that all identified equipment would not only operate

² Noise levels would be approximately 12 dBA higher at this receptor because noise levels attenuate with distance at a slower rate over water than over open land.

simultaneously, but also all identified equipment would operate along the borrow area/staging area boundary located closest to identified receptors. Although with the assumed simultaneous operation of trucks and equipment along the eastern boundary the project exceeds ambient nighttime noise levels, this scenario is highly improbable since the estimated 11 articulated trucks would not likely all operate along the eastern borrow area boundary simultaneously.

Implementation of noise controls as necessary (Mitigation Measure 5.14.1) would be adequate to reduce construction noise to below the 50-dBA sleep interference criterion. Construction noise still could be audible periodically since maximum noise construction noise levels could exceed nighttime ambient noise levels (36 dBA) at Receptor B, as indicated in Table 4.14.6. However, mitigated noise levels would be below the 50-dBA sleep interference criterion and, therefore, less than significant.

Construction of a jetty at the south end of the reservoir under the barging haul option (if used) would require pile driving. However, potential noise increases associated with this activity would be less than significant because vibratory pile drivers are proposed to be used and pile driving would be restricted to the daytime hours. This would ensure that pile-driving-related noise would not exceed existing daytime ambient noise levels at the closest receptor (Receptor B), as indicated in Table 4.14.5. Tables 4.14.5 and 4.14.6 indicate that pile driving and barging activities at the north end of the reservoir would be less than significant at the closest receptor to the north (Receptor F).

Operation of construction equipment in Borrow Area E would also include use of back-up beepers. At a minimum distance of 3,000 feet to Receptor B (the closest residential receptor to this borrow area), back-up beepers mandated by worker safety requirements could generate noise peaks ranging from 35 to 55 dBA (L_{max}). Such noise levels could periodically exceed the measured daytime and nighttime ambient noise levels of 45 and 36 dBA, respectively, and therefore, could be audible at the closest receptors (Receptors A, B, and C) both during the day and night. Since multiple pieces of equipment would operate, it is possible that back-up beepers could exceed the Santa Clara County Noise Ordinance nighttime limit of 55 dBA (limit cannot be exceeded for more than five cumulative minutes in any given hour) at these receptors, but would not likely exceed the daytime limit of 65 dBA (limit cannot be exceeded for more than five cumulative minutes in any given hour). There are no feasible measures that could reduce noise associated with back-up beepers while still meeting California Department of Industrial Relations, Division of Occupational Safety and Health worker safety regulations. Given the disturbing nature of back-up beepers and their use during the nighttime hours, proposed nighttime construction in this area could cause sleep disturbance at the closest receptors (particularly if windows are open), which would be a significant and unavoidable impact.

Impact Conclusions

Construction activities in the dam vicinity, Disposal Site 7, and Borrow Area E would occur 20 hours per day, 6 days per week for approximately 4 years. Since construction activities would occur during hours beyond the time limits specified in the Alameda County and Santa Clara County Noise Ordinances, these activities would result in a significant noise impact and nighttime construction noise levels would need to be reduced to applicable ordinance nighttime noise limits and the 50-dBA sleep interference criterion in order to reduce this impact to a less-than-significant level.

Despite construction activities occurring beyond the ordinance time limits, noise levels presented in Tables 4.14.5 and 4.14.6 demonstrate that with Mitigation Measure 5.14.1 construction noise would not exceed ordinance noise limits at the closest residential receptors, with the possible exception of back-up beepers. Construction activities during the daytime hours would be noticeable at times, but would not result in significant, adverse noise impacts on existing residential receptors. Noise from certain construction activities during the nighttime hours could also be noticeable at residential receptors located near Borrow Area E, and could result in sleep interference effects at Receptor B, which would be a potentially significant impact.

Implementation of noise controls as necessary (Mitigation Measure 5.14.1) would be adequate to reduce construction noise to meet the sleep interference criterion, reducing this impact to a less-than-significant level most of the time. However, even with this mitigation measure, back-up beepers could exceed ordinance limits and the 50-dBA sleep interference criterion during the nighttime hours on a regular basis for a substantial portion of the 4-year construction period, which would be a significant and unavoidable impact. Mitigated construction noise from other sources could, at times, still be noticeable to some of the closest noise-sensitive receptors during the nighttime hours because ambient noise levels are lower in some areas around Borrow Area E than noise ordinance limits and the 50-dBA sleep interference criterion. Mitigation Measure 5.14.1 would reduce construction noise to ordinance limits and below the sleep interference criterion, but would not reduce noise to ambient noise levels. In addition, the closest residential receptors could still be subject to noise disturbances, from peak noise events such as back-up beepers.

Impact 4.14.2: Temporary noise disturbance along construction haul routes.

Hauling of materials from off-site locations is proposed to occur between 7 a.m. and 5 p.m. on weekdays and Saturdays, but could also occur at night (between 5 p.m. and 7 a.m. Monday through Friday). Hauling would occur for approximately up to 3 years. As indicated in Table 4.12.2, Daily Construction Vehicles Between Project Work Area and Off-Site Locations in Section 4.12, Transportation and Circulation, project construction could generate up to 330 worker vehicles and 88 trucks on a daily basis on Calaveras Road (north of the dam). Since a portion of Calaveras Road would be closed for a 2-month period and again for an approximately 18-month period (see Figure

4.12.1, Project Area Roads, in Section 4.12, Transportation and Circulation), traffic and associated noise along this roadway would decrease from current levels because project-related vehicle volumes would be lower than existing traffic levels on this roadway. However, the number of haul trucks using this road would increase during project construction.

Truck noise levels depend on vehicle speed, load, terrain, and other factors. The effects of construction-related truck traffic would depend on the level of background noise already occurring at a particular receptor site. In quiet environments or during quieter times of the day, truck noise is mainly a single-event disturbance, because although the hourly average associated with short single events is not very high, individual noise peaks of 80 to 91 dBA at 50 feet are common during a truck passage. In noisy environments or during less noise-sensitive hours, truck noise would be perceived as a part of the total noise environment rather than as an individual disturbance.

Project-related truck traffic on haul routes would increase ambient noise levels along these routes, particularly if haul trucks are operated during the nighttime hours (10 p.m. to 7 a.m.). Haul trucks traveling between the dam vicinity and Disposal Sites 3 and 7 are proposed to operate 20 hours per day. Haul trucks traveling between the dam vicinity and Borrow Area E, as well as those delivering materials from off site, are proposed to operate 10 hours per day, but could occur during the daytime or nighttime hours. Truck volumes would vary from day to day and with each stage of project construction.

Haul routes that have the greatest potential to affect the closest identified sensitive receptors are described below.

Haul Route Between Dam Vicinity and Disposal Site 7

This haul route would operate 20 hours per day, 6 days per week, and would generate truck noise during the more noise-sensitive nighttime hours. As shown in Table 4.14.6 (see Haul Route, Receptor B), the closest residential receptor to this haul route is Receptor B, located approximately 2.5 miles to the south. Based on estimated average hourly truck volumes of up to 10 trucks per hour, truck-related noise levels would not exceed daytime or nighttime ambient noise levels, speech and sleep interference criteria, or noise ordinance limits. Truck noise would be lower at other, more distant residential receptors to the south and southwest. Therefore, truck-related noise increases associated with proposed use of this haul route would result in less-than-significant noise impacts at the closest residential receptors.

West Haul Route

The west haul route would operate 10 hours per day, 6 days per week, and could operate during the more noise-sensitive nighttime hours. Receptor A would be approximately 3,600 feet to the

west of the west haul route. Using an estimated average hourly truck volume of 25 trucks per hour, Tables 4.14.5 and 4.14.6 (see Haul Routes, Receptor A) indicate truck-related noise levels along this haul route would not exceed daytime or nighttime ambient noise levels, speech and sleep interference criteria, or noise ordinance limits. Therefore, truck-related noise increases associated with proposed use of this haul route would result in less-than-significant noise impacts at the closest residential receptors.

Calaveras Road (North of Dam in the Sunol Valley)

This haul route would operate 10 hours per day, 6 days per week, and could operate during the more noise-sensitive nighttime hours. The closest residential receptors to this section of Calaveras Road are 225 feet to the east (Receptor H, watershed keeper's residence), and 2,000 feet to the west (Receptor D, ranch residences), near the San Antonio Pump Station facility. Receptor F, a private residence, is set back a similar distance from Calaveras Road (approximately 2,200 feet to the west). Using the estimated peak hourly volumes of 26 trucks and 83 worker vehicles per hour, Tables 4.14.5 and 4.14.6 (see Haul Route, Receptors D and H) indicate traffic-related noise levels along this haul route would not exceed daytime or nighttime ambient noise levels, the speech and sleep interference criteria, or noise ordinance limits at the closest private residential receptors. However, traffic-related noise levels on Calaveras Road would exceed daytime and nighttime ambient noise levels, and the 50-dBA sleep interference criterion and the 53-dBA nighttime noise ordinance limit could be exceeded by up to 5 dBA. While topographic characteristics would likely partially block traffic noise, reducing it at this residence by at least 5 dBA, implementation of noise controls that limit nighttime truck operations to maintain noise levels at 50 dBA at the closest receptors (Mitigation Measure 5.14.1) would be required to reduce this potential impact to a less-than-significant level.

Impact Conclusions

Vehicular traffic generated by project workers on Calaveras Road would not significantly increase noise levels along this road. Truck traffic generated on Calaveras Road, as well as on proposed on-site roads, would generate noise increases that were determined to be less than significant at all sensitive receptors except at the watershed keeper's residence on Calaveras Road (Receptor H). At this residence, peak hourly project-related vehicle and truck increases could result in nighttime noise levels that exceed the 50-dBA sleep interference criterion and 53-dBA nighttime ordinance noise limit, which would be a potentially significant impact. While topographic characteristics between Calaveras Road and this residence likely provide sufficient noise reduction, implementation of Mitigation Measure 5.14.1 would ensure that nighttime truck traffic noise is reduced to ordinance limits and below the sleep interference criterion. Although this impact would be reduced to a less-than-significant level, this measure would not reduce truck

noise to below ambient noise levels, so it is possible that truck traffic noise could be audible at this residence during the nighttime hours.

Impact 4.14.3: Disturbance due to construction-related controlled blasting.

Proposed dam construction would include controlled blasting activities. Blasting would be required in the following areas: (1) excavation for the foundation of the dam; (2) excavation in the left (west) abutment for the spillway excavation (also providing materials for replacement dam construction); and (3) in Borrow Area B (existing quarry) to provide rockfill for replacement dam construction and to construct the new spillway. It is expected that blasting could occur almost daily in one or more of these areas during the first 2 years of construction. Blasting would be confined to daylight hours, Monday through Friday.

Boulder blasting (or black-holing) would involve use of small charges to break boulders. Charges for this blasting are usually one pound or less. It is likely that some boulder blasting would occur to reduce oversized rock.

Controlled rock blasting would be performed by drilling holes approximately 6 inches in diameter in a specified pattern in rock benches to a depth of approximately 40 feet. Holes would be charged with ammonium nitrate – fuel oil blasting agents primed with a cast booster armed with a non-electric detonator. Explosives charges are detonated one hole at a time, using a time delay between successive detonations; delay intervals of 8 milliseconds or more are used to prevent cumulative blast effects. The entire detonation of a typical blast would be less than 2 seconds. Detonations typically occur once or twice per day and vibration produced by such detonations can be controlled by varying the charge-per-delay (the amount of explosive per delay in each hole) based on distance to points of concern. The weight of a typical individual charge would not exceed 400 pounds.

Based on measurements collected by the SFPUC at other construction projects, controlled blasting could generate noise levels of approximately 125 dBA at 100 feet (SFPUC 2006). Since blasting would occur in the dam vicinity and the closest residential receptors (Receptors A and G) are located approximately 3 and 1.4 miles (16,800 and 7,400 feet), respectively, to the south and north of the dam (see Table 4.14.5), blasting activities could generate 2-second peak noise events of approximately 80 and 89 dBA (L_{max}), respectively. Receptors E and F would be subject to peak noise levels that are slightly lower than those estimated at Receptor G. The estimated 80 and 89 dBA (L_{max}) is likely an over-prediction since it does not account for any atmospheric absorption or topographic barrier effects. Such noise peaks would occur once or twice per day. Since they would exceed the existing daytime ambient noise level of 45 dBA (L_{eq}), these peak noise events could be audible at residential receptors to the north and south. In addition, these noise events could exceed the Santa Clara County and Alameda County Noise Ordinance noise limits (an instantaneous maximum noise event of 75 dBA during any given hour in Santa Clara

County and 70 dBA during any given hour in Alameda County) at the closest residential receptors to the north and south, and the potential for disturbance of the closest residential receptors from this activity would be significant.

Impact Conclusion

It is difficult to predict the actual attenuation rate of blasting noise since the rate is affected by intervening terrain and the noise frequency (low-frequency noise is not absorbed by the atmosphere as well as higher frequency noise). Nevertheless, blasting activities could generate peak noise events that result in momentary speech interference effects (2 seconds) that are up to 19 dBA above the 70-dBA speech interference criterion once or twice per day. Modifying blast charges (Mitigation Measure 5.14.3) to reduce noise levels to 112 dBA at 50 feet or 106 dBA at 100 feet would reduce blasting noise impacts to a less-than-significant level. If reducing the size or number of charges to limit noise generation potential is infeasible, then reducing the frequency of blasting to once per day would be required to reduce the potential for noise disturbance to a less-than-significant level.

Impact 4.14.4: Disturbance due to construction-related vibration.

Project construction would involve controlled blasting, which could generate vibration. Pile driving for construction of the barge jetty at the south end of the reservoir (if the barge haul option is selected) could also generate vibration. Controlled blasting would occur in the dam vicinity. The closest residential receptors are located approximately 6,700 feet from the proposed barge docks if barging is selected, and 10,400 feet from the dam vicinity. At these distances, vibration generated by proposed controlled blasting and pile driving activities for the barge dock at the southern end of the reservoir would be well below the thresholds for cosmetic damage (0.2 in/sec [PPV] for impact and vibratory pile drivers and 0.5 in/sec [PPV] for controlled detonations) and for annoyance (0.012 in/sec [PPV]), and therefore would not significantly affect the closest residential receptors.

Impact Conclusion

Controlled blasting would not generate structural damage if it produced vibrations of less than 0.5 in/sec PPV (measured at the residential building setback line at the ground surface). This level is consistent with the U.S. Bureau of Mines' threshold cracking criteria of 0.5 in/sec PPV for low frequencies and 2.0 in/sec PPV for high frequencies (Wilson, Ihrig & Associates 2005). The extent of vibration generated by controlled blasting would depend on the size of the charge, but at distances of over 3 miles, vibration generated by blasting activities would remain well below the thresholds described above. Vibration from pile driving would also be below thresholds. Therefore, this impact would be less than significant.

Operational Impacts

Impact 4.14.5: Disturbance due to long-term noise increases associated with operation of project facilities.

The proposed project would not involve addition or expansion of pumps, transformers, emergency generators, or any other facilities that generate permanent noise except for addition of a supply and exhaust fan in the new intake tower at the dam. It is assumed that this fan would be located within the new tower with a vent opening for the exhaust fan. Fans typically generate noise levels of 76 dBA at 15 feet, and its location within the tower would likely attenuate fan noise by at least 10 to 15 dB, resulting in noise levels of up to 66 dBA at the vent opening. The closest noise-sensitive receptor is the watershed keeper's residence, located approximately one-third mile to the south, and fan noise could be as high as 27 dBA at this residence, which would not exceed ambient noise levels.

Impact Conclusion

Operation of the proposed replacement dam is not expected to significantly increase ambient noise levels in the dam vicinity. Therefore, operational noise impacts would be less than significant.

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- Wilson, Ihrig & Associates, Inc. 2005. *Final Technical Report, San Francisco Public Utilities Commission, New Crystal Springs Bypass Tunnel, Noise and Vibration*, October 12, 2005.

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4.15 UTILITIES, SERVICE SYSTEMS, AND PUBLIC SERVICES

Section 4.15 Contents	
4.15.1 Setting	4.15.2 Impacts
4.15.1.1 Fire Protection	4.15.2.1 Significance Criteria
4.15.1.2 Law Enforcement	4.15.2.2 Approach to Analysis
4.15.1.3 Solid Waste Disposal	4.15.2.3 Project Impacts
4.15.1.4 Public Utilities	
4.15.1.5 Regulatory Framework	

This section discusses potential impacts on public services and utilities that could result from construction and operation of the replacement dam. Fire protection, law enforcement, and solid waste disposal services, as well as natural gas and electricity conveyance facilities, are addressed.

4.15.1 SETTING

4.15.1.1 FIRE PROTECTION

Subsection 4.15.1.1 Contents

Fire Protection Service Providers

California Department of Forestry and Fire Protection

SFPUC's Alameda Creek Watershed Keepers

EBRPD Fire Department

Alameda County Fire Department

Spring Valley Volunteer Fire Department

Santa Clara County Fire Department

SFPUC Fire Suppression

Fire is a particular concern on the greater Alameda Creek watershed. The hot, dry summers and acres of grassland make the area particularly susceptible to fires. Most measurable rainfall occurs from mid-October to mid-April. May to October is the fire season, and July is the time of highest fire danger (SFPUC 2001, p. III.G-6). The greater Alameda Creek watershed, including the project area, is identified as a "Wildland Area that May Contain Substantial Forest Fire Risks and Hazards" (CDF 2000b). The San Francisco Public Utilities Commission (SFPUC) Alameda Watershed is near populated urban areas and the build-up of fuels can pose a risk to public safety, public and private property, and the natural resources of the watershed. A wildfire could have serious impacts on water quality, water supply, and ecological and cultural resources, as well as on adjacent residential areas and on the aesthetics of the watershed. Communities in the vicinity of the project area include Milpitas (population 66,568) and Fremont (population 211,662) to the west, and Pleasanton (population 68,755) and Livermore (population 82,845) to the northeast (California Department of Finance 2007). Lands to the south and east are generally unincorporated ranchlands; however, these lands are under residential development pressure. The

unincorporated town of Sunol (population 1,328 in year 2000 [U.S. Census 2000]) is adjacent to the northern boundary of the SFPUC Alameda Watershed. This development increases the possibility of urban/wildland interface fires. (Fire hazards are discussed in Section 4.9, Hazards and Hazardous Materials.)

Most of the SFPUC Alameda Watershed, including portions of the project area, has been used for grazing for more than a century (see Section 4.3, Land Use, Agricultural Resources, and Recreation, for a discussion of grazing activities). Grazing and mowing are considered important tools in managing fire because they reduce the amount of grass and other vegetation that might quickly ignite if left unmanaged during the area's long, dry, hot summers.

Fire Protection Service Providers

In the east county area of Alameda County and northern portion of Santa Clara County, including the project site, the California Department of Forestry and Fire Protection (CDF) is designated as the primary responder for all wildfires (Burr Consulting 2004a). In case of a major wildfire, city and county fire departments in Alameda and Santa Clara Counties would respond upon request under countywide mutual aid agreements and as part of the State Master Mutual Aid Plan (Burr Consulting 2004b) (Matrix Consulting Group 2004). The SFPUC Alameda Creek watershed keepers and the East Bay Regional Park District (EBRPD) Fire Department would also be primary responders.

California Department of Forestry and Fire Protection

The CDF provides fire-fighting services for the greater Alameda Creek watershed because these lands are within a defined State Responsibility Area (SRA).¹ In general, the responsibility of the CDF ends with wildland protection unless specific countywide or automatic aid agreements are in place. SFPUC-owned watershed lands are located within an SRA (CDF 2007). CDF Station No. 14, located at 11345 Pleasanton-Sunol Road (the Sunol Unit), provides fire-fighting services within this SRA. Portions of the SRA are also served by the EBRPD Fire Department under contract with the SFPUC. In those areas, the EBRPD Fire Department is the primary responder; however, the CDF is ultimately responsible for the parklands under the jurisdiction of the EBRPD because these lands are located within the SRA.

¹ The State Responsibility Area classification system defines land for which the state assumes primary financial responsibility for protecting natural resources from fire damage. This system is not based on the ability to protect an area from fire, but on the vegetative cover and natural resource values of lands covered wholly or in part by forests or by trees producing or capable of producing forest products, lands covered wholly or in part by timber, brush, undergrowth, or grass, whether of commercial value or not, which protect the soil from excessive erosion, retard runoff of water or accelerate water percolation, if such lands are sources of water which is available for irrigation or for domestic or industrial use, and lands in areas which are principally used or useful for range or forage purposes all of which are contiguous to the lands.

The Sunol Unit service area extends west from Castlewood Drive (near Pleasanton) south to Vargas Road (near Fremont) then on State Route 84 from Pigeon Pass (near Livermore) and to the City of Fremont city limits on Niles Canyon Road² (Burr Consulting 2004b). The Sunol Unit is equipped with one Type I³ engine and has a staff of nine throughout the whole year. During the fire season, CDF equips this station with two additional Type 3 engines with a three-person company each, a bulldozer unit, and a battalion chief. For a wildfire, the CDF has the ability to dispatch eight engines, two bulldozers, a helicopter, an air attack plane (spotter), two air tankers (loaded with retardant), and two chief officers from this station and other CDF stations in the region.

The Sunol Unit also provides service to the unincorporated town of Sunol and the neighborhood of Kilkare Woods under contract with the Alameda County Fire Department (ACFD). In the eastern part of Alameda County, the CDF is responsible for fighting brush fires on open rangeland and wildlands, as well as for assisting the ACFD with structure fires. The CDF provides fire-fighting services under mutual aid agreements to many of the neighboring city fire departments and to adjacent county fire departments and other agencies, including the Fremont Fire Department, the Livermore/Pleasanton Fire Department, the ACFD, the Santa Clara County Fire Department (SCCFD), and the EBRPD Fire Department (Burr Consulting 2004a, Matrix Consulting Group 2004).

SFPUC's Alameda Creek Watershed Keepers

SFPUC staff includes on-site personnel known as watershed keepers. Six Alameda Creek watershed keepers are responsible for monitoring assigned portions of the watersheds and providing immediate first response to emergencies. The watershed keepers' primary function is to protect the watershed and, thereby, the water supply. Their duties include suppressing fires, monitoring reservoir and stream levels, monitoring water quality, removing trespassers, assisting the public, monitoring the watersheds for road and other erosion damage, and checking system facilities immediately after an earthquake (SFPUC 2001). The watershed keeper at the Calaveras Reservoir lives on site and is stationed south of the dam on the eastern shore of the reservoir. The watershed keeper is the primary responder to fires in the area.

EBRPD Fire Department

The EBRPD Fire Department is responsible for fire prevention and suppression, emergency medical services (EMS), hazardous materials incidents response, and search and rescue (Burr

² State Route 84 turns into Niles Canyon Road.

³ The difference between fire engines is based on a variety of criteria including the number of feet of ladder, number of feet of hose, hose diameter, maneuverability, and pumping capacity. These differences result in Type 1 engines being the primary engine for structure fires, with each grade down to Type 4 engines being more appropriate for fighting wildfires.

Consulting 2004b). The department is capable of responding to both wildland and structure fires (Burr Consulting 2004b). The EBRPD Fire Department's response area includes areas both within and adjacent to EBRPD parklands. Fire response on portions of EBRPD lands in Alameda County that are also in an SRA is shared with the CDF; fire response on EBRPD land within cities is shared with municipal fire departments. The EBRPD Fire Department also responds regularly to assist the CDF with wildfires in SRAs, and the CDF assists on an as-needed basis with wildfires in the parks. The EBRPD Fire Department maintains mutual response agreements with the ACFD and other fire departments (Burr Consulting 2004b).

The EBRPD Fire Department operates out of ten fire stations, six in Alameda County and four in Contra Costa County (Burr Consulting 2004b). Fire Station No. 10, located at 17930 Lake Chabot Road in Castro Valley, serves as the EBRPD Fire Department headquarters and is staffed year-round. Fire Station No. 1 in the East Bay Hills (near the City of Berkeley in Tilden Regional Park) is the EBRPD Fire Department's main operations station and is staffed during daylight hours 7 days per week during the wildfire season. Fire Station No. 5 at Lake del Valle (Livermore) is staffed on weekends during peak fire season. The EBRPD Fire Department employs 13 full-time personnel (10 are employed year-round and 3 work 9 months of the year) for fire and EMS response. An additional 48 full-time employees, who hold primary positions outside the EBRPD Fire Department, are "on-call" to assist the EBRPD Fire Department during the peak fire season. The EBRPD Fire Department also staffs the stations in response to extraordinary visitor use, wildfires, and fire-prone weather conditions (Burr Consulting 2004b).

The EBRPD Fire Department has primary responsibility on SFPUC lands that augment the Sunol and Ohlone Wilderness Regional Preserves north of the project area. The leased areas are located northwest of the project area off Calaveras Road and Geary Road, and north and east of the project area off the Ohlone Trail. The EBRPD Fire Department shares responsibility with the CDF on the remainder of the SFPUC Alameda Watershed. Fire Station No. 10 and Fire Station No. 5 are the first-response stations for this area; however, Fire Station No. 10 is staffed year-round while Fire Station No. 5 is staffed only on weekends between June and mid-November. Each of the fire stations is equipped with one Type 3 and one Type 4 fire engine. The EBRPD uses helicopters to respond to fires during the summer fire season. The helicopters use water from Calaveras Reservoir to fight fires.

Alameda County Fire Department

The ACFD service area includes most of the unincorporated areas of Alameda County. The service area encompasses 453.1 square miles plus the cities of Dublin and San Leandro (Burr Consulting 2004b). The ACFD is responsible for fire suppression and prevention, emergency medical response, hazardous materials and disaster response, and urban search and rescue. The ACFD operates out of 18 fire stations, 8 of which are located in the unincorporated areas. Fire

Station No. 14 is an ACFD facility that is staffed and operated by the CDF (Burr Consulting 2004b). The CDF provides service to the unincorporated Alameda County town of Sunol and the neighborhood of Kilkare Woods under contract. These residential areas are near the SFPUC-owned watershed lands. This fire station also functions as the station that provides fire protection services for the SFPUC Alameda Watershed lands and the larger SRA.

Spring Valley Volunteer Fire Department

The Spring Valley Volunteer Fire Department (SVVFD) is a non-profit, public benefit corporation staffed by volunteers. Spring Valley is located in the foothills on the eastern edge of Santa Clara County east of the City of Milpitas in the vicinity of the project area. The SVVFD service area is rural with large private ranches and single-family residences. The SVVFD protects structures in this unincorporated area of approximately 30 square miles from three fire stations. The SVVFD has mutual aid agreements with nearby fire-fighting agencies including the CDF. The volunteers who staff the SVVFD routinely train with these departments, with most dispatching and training administered by the CDF.

Santa Clara County Fire Department

The SCCFD serves unincorporated areas of the county as well as the communities of Campbell, Cupertino, Los Altos, Los Altos Hills, Los Gatos, Monte Sereno, Morgan Hill, and Saratoga. The SCCFD responds to calls in the vicinity of the project area as part of a countywide mutual aid system (Matrix Consulting Group 2004). The SCCFD is configured into three battalion districts. First-call equipment for fire-fighting and EMS is deployed within 5 minutes at least 90 percent of the time (Matrix Consulting Group 2004).

Wildland/urban interface companies are trained and equipped to provide structure protection and limited initial response to wildfires. Two engine companies, a brush patrol⁴ (Type III or Type IV engine), and a Battalion Chief, for a total of nine persons, are dispatched in response to a brush alarm for vegetation fires in wildland/urban interface areas. Brush patrols and ladder trucks are on patrol duty for select-call response during high fire-danger periods. In daily operations during the fire season, when the probability of a brush fire is high, the ladder truck and patrol go out on calls as a pair during daytime hours. However, engines respond instead of ladder trucks in a wildland/urban interface area (SCCFD 2007).

⁴ A patrol is a smaller, all-wheel drive vehicle designed for fighting wildfires. It has a smaller pump than an engine, a hose, wildfirefighting tools, and off-road driving capabilities with a high ground clearance. A brush patrol is staffed by two members of a four-person ladder truck company.

SFPUC Fire Suppression

Emergency water facilities consist of water hydrants at the watershed keeper's residence that connect to a 2-inch supply pipe, and three water hydrants along the Calaveras Pipeline. However, Calaveras Reservoir is the major source of supply for fire-fighting water. The watershed keeper is equipped with a truck that includes pumps to draw water from the reservoir and several tanks with a storage capacity of 100 gallons each (Naras, pers. com.).

The Calaveras Pipeline is also a primary source of water and has two fire hydrants located in the Sunol Wilderness Regional Preserve, a 6-inch hydrant and a 4-inch hydrant, that reduce to a 2-inch hydrant.

Water sources for fire fighting in the SFPUC Alameda Watershed other than water pumped from Calaveras Reservoir are limited. There are nine hydrants located on valley floors within the watershed and seven water tanks in different locations throughout the watershed (San Francisco Planning Department, 2001b, p. III-G.6).

4.15.1.2 LAW ENFORCEMENT

Subsection 4.15.1.2 Contents

SFPUC's Alameda Creek Watershed Keepers
EBRPD Police Department
California Highway Patrol
Alameda County Sheriff's Office
Santa Clara County Sheriff's Office

Law enforcement in the project area is provided in part by SFPUC Alameda Creek watershed keepers, the EBRPD Police Department, the Alameda County Sheriff's Office (ACSO), and the Santa Clara County Sheriff's Department. Mutual aid agreements exist among these agencies and with other adjacent agencies including the City of Milpitas. The Alameda County Emergency Operations Center coordinates all law enforcement mutual aid requests for the 16-county northern California area, from Monterey to the Oregon border.

SFPUC's Alameda Creek Watershed Keepers

The watershed keeper at the Calaveras Reservoir is stationed south of the dam on the eastern shore of the reservoir. The watershed keeper's duties include removing trespassers; however, the watershed keeper is not a sworn officer. The watershed keeper would contact nearby law enforcement agencies, such as the EBRPD Police Department or the ACSO, for assistance with law enforcement activities.

EBRPD Police Department

The EBRPD's Police Department, located at 17930 Lake Chabot Road in Castro Valley, specializes in policing wilderness areas and, along with the ACSO, conducts search and rescue operations. The department provides helicopter patrol and search and rescue services to agencies requesting mutual aid. The EBRPD Police Department also provides law enforcement, patrol, and search and rescue services on EBRPD lands and, by service contract, on SFPUC watershed lands.

California Highway Patrol

The California Highway Patrol provides traffic enforcement services on interstate highways, state routes, and county roads in unincorporated parts of Alameda and Santa Clara Counties that are in the vicinity of the project area, including I-680, State Route 84, and Calaveras Road.

Alameda County Sheriff's Office

Law enforcement services in the unincorporated areas of Alameda County are provided by the ACSO. The ACSO provides law enforcement, patrol, investigative services, and crime prevention programs. The Sheriff's Office has approximately 1,500 authorized positions, including approximately 1,000 sworn personnel (Burr Consulting 2004b).

The ACSO service area is divided into five patrol sectors, and law enforcement services are located in ACSO headquarters in Oakland and in the Eden Township Substation. The Eden Township Substation, located at 15001 Foothill Boulevard in San Leandro, functions as the Sheriff's main station for municipal police services to the east county area of Alameda County (Burr Consulting 2004b). It provides law enforcement services for a population of approximately 150,000 in the unincorporated areas of Alameda County, including San Lorenzo, Ashland, Cherryland, Castro Valley, Sunol, Livermore Valley, and other unincorporated areas scattered throughout the County, including the project site. The Eden Township Substation is approximately 30 miles north and east of the project site.

Santa Clara County Sheriff's Office

The Santa Clara County Sheriff's Office (SCCSO) serves the communities of Cupertino, Los Altos Hills, Saratoga, and the unincorporated areas of the County. With a total County population of approximately 1.7 million people, the Sheriff's Office has a service population of approximately 197,000. The SCCSO has 635 full-time, sworn officers and is divided into three major bureaus: Field Operations, Support Services, and Administrative Services (Matrix Consulting Group 2004).

A Parks Patrol unit operates under the Headquarters Patrol Division and provides law enforcement services within the 27 Santa Clara County parks, including Ed R. Levin Park, located west of Calaveras Road near the project site. Officers assigned to the Rural Crime Unit and the Off-Road Enforcement Team provide specialized law enforcement services in unincorporated areas of the county including the Mt. Hamilton area, south of the Calaveras Reservoir. Officers assigned to these areas would be available to respond to calls from the watershed keeper.

4.15.1.3 SOLID WASTE DISPOSAL

The 2,170-acre Altamont Sanitary Landfill and the 644-acre Vasco Road Sanitary Landfill, located in northeastern Alameda County, handle most of the county's solid waste, including solid waste from the SFPUC-owned Alameda Watershed lands. The Tri-City Recycling and Disposal Facility in Fremont is the county's only other active landfill. The Altamont facility is located east of Dyer Canal and north of Altamont Pass Road, northeast of the City of Livermore. The Altamont and Vasco Road facilities both accept construction/demolition waste and would handle any waste generated as part of the proposed replacement of the Calaveras Dam. The Altamont Sanitary Landfill has a remaining estimated permitted capacity of approximately 124,400,000 cubic yards, and the Vasco Road Sanitary Landfill has a remaining estimated permitted capacity of approximately 12,279,865 cubic yards.

4.15.1.4 PUBLIC UTILITIES

Public utilities located within the SFPUC Alameda Watershed are a mix of privately owned, utility-owned, and SFPUC-owned electrical lines, telephone lines, and underground petroleum and natural gas pipelines. In the case of electrical and telephone lines, the more remote a facility or structure in the watershed (e.g., the watershed keeper's residence), the more likely that the utility lines are owned and maintained by the SFPUC. Water supplies are generally provided by a combination of spring water lines, municipal water services from water retailers, and the Sunol Valley Water Treatment Plant.

Pacific Gas and Electric Company (PG&E) operates a 230,000-volt electrical transmission line in the watershed along a corridor west of Calaveras Reservoir that travels between the PG&E Newark substation and the Metcalf substation south of San Jose. In addition, PG&E operates a 60-kilovolt (kV) overhead electrical transmission line along Vallecitos Road north of the project site and 60-kV and 115-kV overhead electrical transmission lines along I-680 north and west of the project site. Three PG&E high-pressure underground natural gas transmission lines are located in the watershed's San Antonio Valley in a corridor east of Vallecitos Road: a 24-inch-diameter line, a 22-inch-diameter line, and a 36-inch-diameter line. PG&E also provides electrical services to facilities within the watershed through overhead 60-kV transmission lines.

The Chevron Pipeline Company operates a pipeline for the transport of refined petroleum products from Tracy in San Joaquin County west and south to a terminal in San Jose. The corridor runs through the San Antonio Reservoir watershed, runs south parallel to Calaveras Road, and then crosses Calaveras Road and Alameda Creek in the Sunol Valley, for a total distance of about 3.3 miles within the watershed. In addition, the SFPUC electrical transmission lines cross through watershed lands west of San Antonio Reservoir and Sunol Valley.

4.15.1.5 REGULATORY FRAMEWORK

Subsection 4.15.1.5 Contents

State Regulations

California Public Resources Code

California Integrated Waste Management Act of 1989

Local and Regional Regulations

Construction and Demolition Debris Recovery Ordinance

Plans and Policies

Alameda Watershed Management Plan

State Regulations

California Public Resources Code

Section 4102 of the Public Resources Code (PRC) defines a SRA as an area of the state for which the state has the financial responsibility for preventing and suppressing fires. Under PRC Sections 4125 and 4126, these SRAs roughly correspond to vegetated lands that have watershed value. By regulation, the State Board of Forestry and Fire Protection has established a system to guide the CDF in determining which lands qualify as SRA. The details are contained in a document entitled *State Responsibility Area Classification System* (CDF 2000a). Lands in incorporated cities or owned by the federal government are excluded. SRA lands cover about 31 million acres in 56 counties. Areas that are not federal or state responsibility are commonly referred to as Local Responsibility Areas, or LRAs.

The SFPUC Alameda Watershed lands are protected by the CDF and, therefore, must comply with PRC Sections 4290 and 4291, which requires vegetation management along structures and roadsides. Requirements include clearing all flammable vegetation for 30 feet around a structure, and keeping roofs free of dead vegetative material. Limbs overhanging roofs must be trimmed of dead material, and branches must be trimmed within 10 feet of chimneys, which must have a screen. Vegetation that is ignited easily (primarily dry grass) must be removed for a distance of 10 feet from each side of the road. While not a requirement, CDF encourages thinning native vegetation and all dead material for an unspecified distance on both sides of roads. PRC Section 4290 includes specifications for any new installations of water supply and storage systems, hydrant fire valves, and road design and signage.

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989 (PRC, Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, requires all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 (PRC Section 41780).

Local Regulations

Construction and Demolition Debris Recovery Ordinance

San Francisco's Construction and Demolition Debris Recovery Ordinance (Ordinance No. 27-06) was adopted and became effective on July 1, 2006. The ordinance added a new chapter to San Francisco's Environment Code and amended the Building Code, the Health Code, and the Police Code. It is applicable to all construction and demolition activities that result in the off-site transport of 1 cubic yard or more of debris. The intent of the ordinance is to establish a comprehensive program that would help the City attain the waste diversion levels required by state mandate (50 percent diversion from landfills by 2000), as well as the City's goals of 75 percent diversion from landfills by 2010 and zero waste by 2020, set forth in the Board of Supervisor's Resolution 679-02.

Construction and demolition debris is defined in the ordinance to include building materials and solid waste generated from construction and demolition activities. Materials and waste include, but are not limited to, fully-cured asphalt, concrete, brick, rock, soil, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, fixtures, plastic pipe, metals, and tree stumps and other vegetative matter from land clearing and landscaping for construction, deconstruction, demolition, or land developments. At a minimum, the ordinance requires that construction and demolition debris be transported by a registered vehicle and processed by a registered facility to ensure proper handling. Requirements for a full demolition include the development of a waste diversion plan that provides for a minimum of 65 percent diversion of construction and demolition debris, including materials source separated for reuse and recycling. The waste diversion plan must be submitted to the Director of the Department of Environment at the time an application for a demolition permit is submitted to the Department of Building Inspection. The plan must include a list of all material types and volumes anticipated from the demolition; the market or destination for each material; the estimated recovery rate (diversion from landfill) by material or market; and the anticipated transporter for each material type.

Plans and Policies

Section 4.2, Plans and Policies, identifies the goals and policies related to utilities, service systems, and public services and addresses the consistency of the proposed project with them. Relevant goals, policies, and management actions of the *Alameda Watershed Management Plan* are discussed below.

Alameda Watershed Management Plan

The primary goal of the *Alameda Watershed Management Plan* is to maintain and improve source water quality to protect public health and safety. This plan includes a set of policies and management actions focused on the protection of the watershed, adjacent urban areas, and the public from fire and other safety hazards. Relevant policies are identified below under the specific primary or secondary goal:

Water Quality

Erosion, Sedimentation, and Runoff

- Policy WQ20: Coordinate water quality concerns with fire management activities to prevent erosion.

Vegetation

Specialized Habitat Considerations

- Policy V10: Manage grasslands and rangelands to balance, wherever possible, wildlife habitat values, the restoration of native perennial species, and the reduction of fuel loads and noxious weeds.
- Policy V11: Manage shrub communities to reduce fuel loads, prevent soil erosion and sedimentation, improve wildlife habitat access and use, and control invasive plants.
- Policy V13: Use controlled fire to enhance natural vegetation regimes, and enhance wildlife habitat.

Fire

Fire Pre-Suppression

- Policy F2: Prohibit smoking, fireworks, and other activities likely to cause a fire as well as equipment that has not been properly equipped, serviced, and maintained in order to prevent fires.
- Policy F3: Require all lessors and permittees to conduct fire hazard reduction activities.

Fire Suppression

- Policy F4: Suppress fires that threaten life, private property, and/or public safety.
- Policy F5: Provide adequate water supplies, road infrastructure, and equipment to allow fire personnel to effectively respond to and suppress fires on the watershed.
- Policy F6: Provide staff training to adequately detect, respond to, suppress, and report on fires on SFPUC lands.

Access Control and Management

- Policy F7: Prohibit unsupervised access to the watershed to reduce the risk of fire.
- Policy F8: Restrict access to the watershed, implement strict fire hazard reduction practices, and initiate the public notification process during periods of extreme fire hazard.

Coordination and Monitoring

- Policy F9: Coordinate fire management activities with the CDF and other mutual-aid fire protection agencies.
- Policy F10: Monitor the effects of fire management activities.

Safety and Security

Public Access

- Policy S2: Maintain and enforce a safety and security program for the watershed.

Response, Monitoring, and Enforcement Procedures

- Policy S9: Adhere to identified appropriate response procedures during the following high priority emergency situations:
 - C. Damaged electric transmission and distribution lines
 - D. Wildfire
- Policy S10: Conduct ongoing boat patrols of watershed reservoirs for surveillance and monitoring purposes.
- Policy S11: Members of the LRMS [Land and Resources Management] staff, with cooperation from other authorized law enforcement agencies, shall strictly enforce all rules, and regulations, federal, state, county, and watershed policies to minimize illegal dumping, poaching, and other trespass and illegal activities on the watershed.

The *Alameda Watershed Management Plan* also includes management actions, specific tasks that guide SFPUC staff, LRMS staff, and, by extension, lessees of SFPUC land in the day-to-day activities that support plan goals and policies. Relevant management actions related to utilities, service systems, and public services are as follows:

- **Action fir1:** Prior to authorizing the use of any vehicle or equipment on the watershed, require that SFPUC vehicle/equipment comply with the fire prevention

regulations established by CDF for use in the watershed prior to authorizing the use of any vehicle or equipment on the watershed. Non-SFPUC equipment must be certified by CDF. All vehicles/equipment shall include spark arrestors and carry fire suppression equipment during fire season.

- **Action fir2:** Install a total of nine dry hydrants into reservoirs or other water sources to reduce the complexity of long-distance water shuttle operations. Dry hydrants shall be installed along Arroyo Hondo, south of the eastern arm of the Calaveras Reservoir on the access road, near Goldfish Pond, where Calaveras Road enters SFPUC land from the southwest, near Ridge Road, near the Diversion Dam.
- **Action fir3:** Install and maintain a total of four helispots on SFPUC property. The helispots shall include a paved area with a catchment system with asphalt berms, and a water collection basin or tank capable of holding approximately 10,000 gallons from which water can be drafted.
- **Action fir4:** Working with adjacent landowners, install three additional helispots off of SFPUC lands.
- **Action fir5:** Working with adjacent landowners, install an additional four dry hydrants off of SFPUC lands.
- **Action fir6:** Install one 10,000-gallon water tank and a supporting water collection system, and one hydrant (to be co-located) in a location near Poverty Ridge.
- **Action fir7:** Identify and construct necessary road improvements including turnouts, turnarounds, and safety zones as topography and soil characteristics permit (exact location to be determined in the field) to provide better access to enhance fire suppression capabilities.
- **Action fir8:** Complete fuel management projects, in coordination with applicable agencies, to reduce fuels on the watershed.
- **Action fir9:** Watershed staff shall report and provide preliminary assessment of all fires to Division Dispatch. Division Dispatch will in turn call 911 and notify the watershed manager.
- **Action fir10:** Following assessment and reporting of the fire, initial response shall be made if the fire appears to be easily suppressed. If the fire is already large or is quickly gaining intensity beyond the capability of limited water and suppression ability, then evacuate and report situation and staff location to watershed dispatch.
- **Action fir11:** If an evacuation is necessary, contact the Alameda and Santa Clara County Sheriff Departments, the Office of Emergency Services (OES), EBRPD, and CDF. Have the dispatcher notify SFPUC employees; and set up an incident command (IC) system and liaison with other agencies.
- **Action fir12:** Prepare and provide to affected agencies and organizations maps and information that depict and explain items such as special requirements within the watershed to protect water quality, safe zones, turnout locations, locations of wet and dry hydrants, helispots/heliports, fuel break locations, natural barriers, evacuation routes, and areas of limited or modified suppression to affected agencies and organizations. Affected agencies and organizations include, but are not limited to,

East Bay Regional Park District, Spring Valley Volunteer Fire Department, Sunol CDF, and the Alameda County Fire Department.

- **Action saf1:** Develop law enforcement procedures for SFPUC and LRMS staff.
- **Action saf2:** Develop and implement an LRMS safety and security program that includes regular maintenance and inspection procedures for areas used by the public; trespassing control; law enforcement responsibilities; on-site risk assessment studies; a system for accident reporting; employee training; watershed fencing inspections and repair procedures; emergency response plan and drills; and allows for periodic program evaluation and updating, as necessary.
- **Action saf3:** Designate and train an LRMS safety coordinator.
- **Action saf6:** Periodically and systematically inspect watershed perimeter fencing, access gates, and locks and repair/replace as required to minimize trespassing, straying cattle, illegal dumping, etc.
- **Action saf7:** Develop and periodically revise an Emergency Response Plan which includes procedures for the following types of emergency situations:
 - C. Damaged electric transmission and distribution lines.
 - D. Fire.
 - G. Human injury incidents/accidents.

Guidelines for emergency response procedures include:

- A. Assess adequacy of elapsed time between emergency occurrence and notification of SFPUC staff.
 - B. Coordinate emergency response with non-SFPUC agencies (e.g., Alameda and Santa Clara Counties, Office of Emergency Services).
 - C. Collect information on all accidents that occur on the watershed, including type of injury, date, time, location, conditions, and activity, as well as injured party (e.g., SFPUC employee or recreationist, scientist, etc.).
 - D. Evaluate all accidents to determine areas which may require modifications for safety reasons.
- **Action saf8:** Periodically conduct emergency response practice drills for the seven types of emergency situations (see Action saf7). Guidelines include:
 - A. Assessment of response time.
 - B. Coordination of practice drills with non-SFPUC agencies.
 - C. Evaluation of drill to identify areas for improvement.
 - **Action saf9:** Periodically evaluate and update the safety and security program.
 - **Action saf11:** Maintain two LRMS patrol boats, one on each reservoir (Calaveras and San Antonio), for ongoing patrols and emergencies.
 - **Action saf13:** Work with CalTrans and Alameda and Santa Clara Counties to install signs, emergency call boxes, and emergency response telephone numbers on I-680, Route 84, and Calaveras Road about risk of fires, vehicle accidents, and risk of spills.

- **Action saf14:** Coordinate with the Alameda and Santa Clara Counties Sheriff and Fire Departments to develop and periodically update an evacuation plan for use during floods, earthquakes, fires, or other natural disasters.
- **Action saf16:** Coordinate with the EBRPD in maintaining and enforcing the safety and security program for areas of the watershed where public access and use are allowed to occur.
- **Action saf17:** Coordinate with Alameda and Santa Clara Counties, and EBRPD to develop a schedule of fines and penalties for watershed infractions.

4.15.2 IMPACTS

4.15.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to public services and utilities, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services;
- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board (RWQCB);
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Not have sufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements;
- Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; or
- Be out of compliance with federal, state, and local statutes and regulations related to solid waste.

4.15.2.2 APPROACH TO ANALYSIS

Potential impacts from the replacement of Calaveras Dam and restoration of pre-DSOD restricted water levels in Calaveras Reservoir on water supply are discussed in Section 6.1, Growth

Inducement. Impacts on water quality, including stormwater drainage issues, are addressed in Section 4.7, Water Quality. Potential hazards related to wildfires are addressed in Section 4.9, Hazards and Hazardous Materials. Potential disruptions of emergency services due to access restrictions are addressed in Section 4.12, Transportation, and Circulation. Energy resources are addressed in Section 4.16, Mineral and Energy Resources.

The construction and operation of the replacement dam would not directly affect the need for public services or governmental facilities, including fire protection, police protection, schools, parks, or other services. The proposed project would not directly change any resident or employed population and therefore would not add to the demand for school facilities. The proposed project would not generate any wastewater and therefore would not result in exceedances of wastewater treatment requirements established by the San Francisco Bay RWQCB. In addition, the proposed project would not require the construction or expansion of water treatment or wastewater treatment facilities because the proposed project would not result in an increase in either water treatment or wastewater treatment demand. Therefore, there is no impact and these topics are not discussed further. This section specifically addresses temporary impacts on fire and law enforcement services, public utilities, and landfills during the construction period.

4.15.2.3 PROJECT IMPACTS

Table 4.15.1 summarizes the project-related impacts on utilities, service systems, and public services described in this section.

Table 4.15.1: Summary of Utilities, Service Systems, and Public Services Impacts

Impact	Level of Significance
4.15.1: Impact of construction activities on the demand for fire protection services.	LS
4.15.2: Impact of construction activities on the demand for law enforcement services.	LS
4.15.3: Impact of construction activities on the demand for landfill capacity.	LS
4.15.4: Impact of construction activities on electrical transmission lines to Calaveras Dam and related structures.	LS
<i>Note:</i> LS – Less than significant	

Construction Impacts

Impact 4.15.1: Impact of construction activities on the demand for fire protection services.

During the 4-year construction period, activities at the project site, near the watershed keeper's residence, at Borrow Areas B and E, Disposal Sites 2, 3, 5 and 7, at the 11 staging areas, and along interior roadways and Calaveras Road would introduce new potential ignition sources in the form of construction vehicles, construction equipment, and construction workers. Major ignition sources for wildfires are typically lightning strikes and human actions (illegal campfires, arson, discarded matches, and cigarettes). In the Alameda Creek watershed, lightning is a fairly uncommon occurrence. The most common cause of fires on the watershed has typically been mechanical equipment, including motor vehicles and landscaping equipment (San Francisco Planning Department 2001, pp. III.G-1-III.G-2).

For traffic safety reasons, the SFPUC would request permission from Alameda County to close, Calaveras Road (except to emergency service vehicles) to the public between Geary Road (near the SVWTP) and a point near the Santa Clara County line from Monday through Friday. The first period would be for approximately 2 months in summer 2011, after which the road would be reopened. The second closure period would last for approximately 18 months beginning in winter 2012. In addition, the SFPUC would request permission from Santa Clara County to close the portion of Calaveras Road between the Alameda County line and Felter Road during the same two periods. During other periods of the 4-year construction period, traffic on Calaveras Road would be subject to periodic halting. The periodic traffic controls and the two road closure periods would result in a reduction in the number of existing unmonitored potential ignition sources (i.e., trespassers who may use Calaveras Road to access the SFPUC Alameda Watershed lands and vehicles that travel along Calaveras Road).

In sum, the proposed project would reduce the number of unmonitored ignition sources introduced to the area via Calaveras Road due to the periodic traffic controls and the two closure periods of Calaveras Road, and would introduce new project-related ignition sources along Calaveras Road and internal roadways in the form of construction vehicles accessing the different job sites and construction-worker-related activities at each of the job sites.

Implementation of regulations governing the use of construction equipment in areas classified as high fire hazard areas by the CDF would be built into the construction contract and would minimize the risk of wildfires. In accordance with the PRC, the construction contractor would be required to comply with the following legal requirements during construction:

- Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildfire (PRC Section 4442).

- Appropriate fire suppression equipment would be maintained during the highest fire danger period – from April 1 to December 1 (PRC Section 4428).
- On days when a burning permit is required, flammable materials would be removed to a distance of 10 feet from any equipment that could produce a spark, fire, or flame, and the construction contractor would maintain the appropriate fire suppression equipment (PRC Section 4427).
- On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines would not be used within 25 feet of any flammable materials (PRC Section 4431).

In addition to these legal requirements, the project would be required to comply with Actions fir1 (Fire Pre-Suppression) and fir8 (Fuel Management) of the *Alameda Watershed Management Plan*, requiring compliance with CDF fire prevention regulations for SFPUC vehicles and equipment, as well as certification by the CDF of non-SFPUC equipment. These actions would help to minimize fire hazard risk.

In the case of a fire at the dam site, disposal sites, borrow areas, staging areas, or along the roadways used to access any of these locations, the SFPUC construction contractors and the watershed keeper at the Calaveras facility would be the first line of defense. When CDF and EBRPD Fire Department staff and equipment arrive on the scene, these agencies would work together to suppress and control the spread of the fire. In the case of a major fire disaster, county and city fire departments would respond by request under existing countywide mutual aid agreements. The SFPUC watershed keeper and the CDF and EBRPD Fire Departments are at a high alert level during the fire season (May to October) and would be informed of the planned timing and nature of construction activities. These fire protection service providers would continue to be the first lines of defense in the case of a wildfire.

The primary water supply sources for firefighting are the Calaveras Reservoir and fire hydrants charged by the Calaveras Pipeline. The availability of water from the Calaveras Reservoir would not be affected by the proposed project. The fire hydrants would remain charged and available throughout the approximately 4-year construction period even though scheduled shutdowns of the Calaveras Pipeline would occur in 2011 and 2012 (or 2012 and 2013). The Calaveras Pipeline is scheduled to be shut down during the warm weather periods (April through November) in years 2011 and 2012 (or 2012 and 2013) as part of the construction of the replacement dam. During the scheduled shutdowns, the fire hydrants would be charged with water from the San Antonio Reservoir when the water elevation in that reservoir is above 445 feet, and by pumps if the San Antonio Reservoir water elevation is less than 445 feet.

Impact Conclusion

Although the proposed project would increase the potential demand for fire protection services on a temporary basis due to the increase in the number of potential ignition sources, compliance with

California statutory requirements in the PRC, CDF regulations, and *Alameda Watershed Management Plan* Management Actions (i.e., Action fir1) would minimize the potential for wildfire ignition. No new firefighting facility would need to be constructed to serve the project area during the construction period. Upon completion of the replacement dam, the demand for fire protection services would return to existing levels and no new or expanded facilities would be needed for any of the fire protection providers serving the project site. Therefore, the temporary impacts of the proposed project on existing fire protection services would be less than significant.

Impact 4.15.2: Impact of construction activities on the demand for law enforcement services.

Law enforcement services within the SFPUC Alameda Watershed are provided primarily by the EBRPD Police Department and the Alameda County Sheriff's Office. The SFPUC would request closure of Calaveras Road, between Geary Road and Felter Road, to the public on weekdays for two periods of the 4-year construction period: approximately 2 months in summer 2011 and approximately 18 months beginning in winter 2012. However, emergency vehicles would still be able to travel on Calaveras Road in response to emergency calls. During other periods of the 4-year construction period, traffic on Calaveras Road would be subject to periodic halting. The periodic traffic controls and the approximately 2-month and 18-month road closures would limit public access to SFPUC watershed lands. This could result in a potential decrease in the number of illegal activities on this portion of the SFPUC Alameda Watershed requiring a law enforcement response.

Impact Conclusion

The periodic traffic controls on Calaveras Road and the two road closure periods could result in less demand for law enforcement services on and adjacent to the project site during the construction period. Upon completion of the replacement dam, demand for law enforcement services would return to existing levels and no new or expanded facilities would be needed for any of the law enforcement agencies serving the project site. Therefore, this project would result in a less-than-significant impact.

Impact 4.15.3: Impact of construction activities on the demand for landfill capacity.

Solid waste generated by the project would include construction debris, demolition materials, excavated soils, and refuse. The largest amount of solid waste generated during construction would be the estimated 3.8 million cubic yards of unused materials that would be placed in the on-site disposal sites. The proposed project includes demolition of the existing spillway and a portion of the existing dam and some of the associated structures (e.g., the warehouse/compressor building). Solid waste from clearing and grubbing activities necessary for grading the construction staging areas, for constructing or improving existing and new roadways, and for

preparing the disposal sites and borrow areas, would also require disposal. Clearing and grubbing work includes removing all vegetation including trees, root systems and shrubs, as well as fencing.

Refuse from construction workers, such as food packaging materials, would be disposed of off site at either the Altamont or Vasco Road Landfills. The amount of waste expected to be generated for off-site disposal would amount to approximately 200 cubic yards on an annual basis. Construction workers would also separate and collect all recyclables (e.g., aluminum and cardboard) for off-site transport. An estimated 500 cubic yards of recyclable materials would be generated on an annual basis.

Some of the materials generated from the excavation or grading associated with the foundation, spillway, borrow areas, disposal sites, haul roads, staging areas, and partial removal of the existing dam would be reused in the construction of the replacement dam and spillway. All excess material and material that is not suitable for dam construction excavated on site would be disposed of on site in one of the four disposal sites. All construction and demolition debris from the demolition of on-site buildings/structures would be sorted on site to identify materials that could be reused or recycled. Construction and demolition debris that could not be reused or recycled would be disposed of on site along with vegetation from clearing and grubbing. If hazardous materials are encountered as part of the excavation and as part of the demolition of existing structures built prior to 1975, these materials would be handled and disposed of according to existing regulations (see Section 4.9, Hazards and Hazardous Materials).

Disposal on site of 100 percent of excavated materials and construction and demolition debris that was not reused or recycled would meet the state's goal of diverting at least 50 percent of generated solid waste from being sent to a landfill. Construction and demolition debris from the full demolition of on-site buildings and structures would be subject to a higher waste diversion threshold, 65 percent. The materials from the demolition of these structures would be accounted for in a waste diversion plan required under the City's Construction and Demolition Debris Recovery Ordinance. As discussed earlier in "Local and Regional Regulations," a minimum of 65 percent of all construction and demolition debris from all buildings and structures, including material source separated for reuse and/or recycling, is required to be diverted from landfills. Refuse generated by construction workers would be diverted from landfills at a rate of at least 50 percent.

Impact Conclusion

The primary solid waste expected to be disposed of off site would be refuse from construction workers. Off-site disposal of this solid waste (approximately 800 cubic yards over the approximately 4-year construction period) is not a permanent waste stream. Disposal of this volume of solid waste would be an occasional event, would only occur during the 4-year

construction period, and would not substantially affect the remaining capacity of the Altamont or Vasco Road Landfills. Therefore, this impact would be less than significant.

Impact 4.15.4: Impact of construction activities on electrical transmission lines to Calaveras Dam and related structures.

During the construction period, Calaveras Dam and Reservoir would continue to operate in a manner similar to the current restricted operations, with two shutdowns of the outlet works during this period (approximately mid-April to mid-November in either 2011 and 2012 or 2012 and 2013). Overhead 60-kV electric transmission lines provide electricity to the dam, associated support structures, and the watershed keeper's residence southeast of the dam. These electrical transmission lines do not serve any other existing residential or commercial uses in the vicinity of the project site.

As part of the proposed project, a portion of the existing dam and certain associated support structures (e.g., the potassium permanganate building and warehouse/compressor building) would be demolished. Two new electrical equipment buildings would be constructed. The hypolimnetic oxygenation system (HOS) facility and bluestone building would remain in their present locations. The watershed keeper's residence would be vacated during construction. Existing electrical transmission lines would continue to provide electricity while new electrical transmission lines are sited and constructed. New electric transmission lines would be constructed and brought into service prior to demolition of existing electric service.

Impact Conclusion

The construction program would be phased to ensure that Calaveras Dam and Reservoir would continue to operate during the 4-year construction period without interruption. Therefore, the removal of existing electrical transmission lines would not disrupt service to Calaveras Dam and Reservoir and the impact would be less than significant.

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4.16 MINERAL AND ENERGY RESOURCES

Section 4.16 Contents	
4.16.1 Setting	4.16.2 Impacts
4.16.1.1 Mineral Resources	4.16.2.1 Significance Criteria
4.16.1.2 Energy Resources	4.16.2.2 Approach to Analysis
4.16.1.3 Regulatory Framework	4.16.2.3 Project Impacts

This section describes the mineral resources at and in the vicinity of the project site and the energy resources that are used now and would be used in the future by the existing and proposed facilities. The Setting subsection presents existing conditions. The Impacts subsection defines the significance criteria and presents a discussion of impacts.

4.16.1 SETTING

4.16.1.1 MINERAL RESOURCES

There are substantial quantities of common rock and aggregate resources in the vicinity of the Calaveras Dam site. Extensive deposits of rock and aggregate materials comprise the hills in the general area including above the spillway of the existing dam (for a more detailed discussion, see Section 4.8, Geology, Soils, and Seismicity). Materials from the quarry on the southwest face of Observation Hill were used in the construction of the existing dam. There are also substantial quantities of clay at the south end of the reservoir. All of these materials are unavailable for commercial use, as they are located within the San Francisco Public Utilities Commission's (SFPUC) primary watershed lands. The SFPUC currently does not carry out any mining on its lands within the area immediately surrounding the reservoir. The SFPUC's *Alameda Watershed Management Plan* limits new mining within the Calaveras Creek, Arroyo Hondo, and upper Alameda Creek sub-watershed lands (see Subsection 4.6.1.3, Regulatory Framework, on the following page).

There are several operating commercial sand and gravel quarries located in the Sunol Valley along Calaveras Road north of the dam site, some of which are on land owned by the SFPUC and leased to quarry operators. Other mineral resources of commercial value (e.g., metals, rare earths, lime, dimension stone) are not present in the project vicinity.

4.16.1.2 ENERGY RESOURCES

The existing dam and its supporting maintenance, water quality management, and residential facilities use energy in the form of electricity for communications, lighting, operation of pumps in the potassium permanganate and hypolimnetic oxygenation system facilities, and operation of the intake and outlet valves. There are no known energy resources (oil, natural gas, geothermal) on the project site. The project site is served by an electric transmission line provided by Pacific Gas

and Electric Company (PG&E), using an amount of electricity equivalent to a portion of the power generated by the SFPUC's Hetch Hetchy Power and Light generation facilities in the Sierra Nevada Mountains. Electric power is used to operate valves, the oxygenation system, and lighting, and for incidental uses. Electric power is provided to the watershed keeper's residence, the only residential use at the site. On the whole, electric power usage for operating the dam is modest (historically about 20,000 kilowatt hours (kWh)/year). In addition, gasoline and diesel fuel are used for motor vehicles.

Calaveras Dam provides water storage but has no facilities for hydropower generation.

4.16.1.3 REGULATORY FRAMEWORK

The SFPUC's *Alameda Watershed Management Plan* includes a policy pertaining to the mineral resources of the watershed. This policy identifies and governs appropriate activities, practices, and procedures on SFPUC watershed lands. The primary goal of the Plan is to maintain and improve source water quality to protect public health and safety. Secondary goals relevant to recreation focus on the continuation of existing compatible uses and the provision of opportunities for potential compatible uses on watershed lands, including educational, recreational, and scientific uses. The relevant policy of the Plan is as follows:

Watershed Activities

- Policy WA5: Prohibit instream mining and/or development along reservoir shorelines and tributary streams which are located within primary watershed lands.

4.16.2 IMPACTS

4.16.2.1 SIGNIFICANCE CRITERIA

The City and County of San Francisco has not formally adopted significance standards for impacts related to mineral and energy resources, but generally considers that implementation of the proposed project would have a significant impact if it were to:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;
- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan; or
- Encourage activities which result in the use of large amounts of fuel or energy, or use these in a wasteful manner.

4.16.2.2 APPROACH TO ANALYSIS

This assessment compares use of mineral and energy resources for the existing Calaveras Dam and its appurtenant facilities with the use of these resources that would occur if the proposed

project is implemented. For energy used during construction, the analysis discusses how construction operations would be conducted to minimize the use of fuels and ensure that they are not used in a wasteful manner.

4.16.2.3 PROJECT IMPACTS

Table 4.16.1 summarizes the project-related mineral and energy resources impacts described in this section.

Table 4.16.1: Summary of Mineral and Energy Resources Impacts

Impact		Level of Significance
4.16.1:	Impact of using rock, clay, and sand to construct the replacement dam.	LS
4.16.2:	Impact of temporary increase in energy use to construct the replacement dam.	LSM
4.16.3:	Impact of using electric power to operate the replacement dam and filled reservoir.	NI
<i>Notes:</i> NI – No impact LS – Less than significant LSM – Less than significant with mitigation		

Construction Impacts

Impact 4.16.1: Impact of using rock, clay, and sand to construct the replacement dam.

As described in Subsection 3.5.1.4, Sources of Material for Construction, in Chapter 3, Project Description, most of the materials that would be needed to construct the replacement dam would be obtained from on-site deposits. Rock and aggregate for the shell and protective riprap zones of the replacement dam would be obtained from borrow areas located adjacent to the existing spillway and Borrow Area B. Clay for the core of the dam would be obtained from a borrow area located at the south end of Calaveras Reservoir. An exception to the on-site availability of construction materials is the sand and gravel that would be used for the filter zones of the replacement dam. As the majority of these are on-site materials, they would not require the use of rock and aggregate resources from commercial sources. These materials also are widely available in the region. Sand and gravel are likely to be obtained from the nearby commercial quarries along Calaveras Road, although they may be imported from other sources.

Approximately 298,000 cubic yards (equivalent to 447,000 tons) of sand and gravel would be used in the construction of the replacement dam. According to the California Department of Conservation, California Geological Survey (California Department of Conservation 2006), approximately 458 million tons of aggregate resources are available in the South San Francisco

Bay region. The amount required for the construction of the replacement dam would be approximately 0.1 percent of the quantity available.

Thus, construction of the replacement dam would not result in the loss of availability of a known mineral resource nor would it result in the loss of availability of a locally-important mineral resource recovery site. The on-site rock, clay, and aggregate resources have not been and are not planned to be made available for any other use besides the replacement dam. The sand and gravel needed for the replacement dam would come from existing off-site quarries; the project's use would make these materials unavailable for use by others. The amounts of sand and gravel needed from off-site sources would not deplete a scarce local or regional mineral resource.

Impact Conclusion

The impact of the proposed project on mineral resources would be less than significant.

Impact 4.16.2: Impact of temporary increase in energy use to construct the replacement dam.

Construction of the replacement dam would involve substantial use of numerous diesel- and gasoline-powered vehicles and other construction equipment for a period of approximately 4 years. Fuel use for construction worker commute trips would be minor compared to the use of fuel by construction equipment. Although fuels would only be used during construction of the replacement dam, excessive idling and other inefficient site operations could result in the wasteful use of fuels. Therefore, the impact of wasteful use of fuels during construction would be potentially significant.

Impact Conclusion

Exhaust control measures specified in Section 4.13, Air Quality, such as limiting idling time and performing low-emissions tune-ups (Mitigation Measure 5.13.1b), would ensure that fuels are not used in a wasteful manner and would therefore reduce this impact to a less-than-significant level.

Operational Impacts

Impact 4.16.3: Impact of using electric power to operate the replacement dam and filled reservoir.

The proposed replacement dam and its appurtenant facilities would use energy for the same uses as at present, i.e., lighting and operation of valves, pumps, and gauges. Energy use at the dam has historically been less than 20,000 kWh per year. Because the project involves replacement, rather than expansion, of the Calaveras Dam and outlet works, there would not be a significant increase in the amount of energy used, i.e., less than 20,000 kWh per year. A typical U.S. household

consumes about 11,000 kWh per year;¹ thus, the proposed project would use an annual amount of energy equivalent to less than two households. The project would comply with Water System Improvement Program (WSIP) Mitigation Measure 4.15-2 by reducing energy use wherever possible; however, as a very small amount of energy is used under baseline conditions to operate the reservoir, and as project operations would not substantially increase energy use, the potential for substantial energy use reduction is limited (see Appendix I for WSIP Program EIR mitigation measures).

Impact Conclusion

The project-generated demand for electricity would be small in the context of the overall demand within the San Francisco Bay area and the state, and would not require a major expansion of power facilities. As a result, there would be no impact.

¹ U.S. Department of Energy, Energy Efficiency and Renewable Energy website.
<http://www1.eere.energy.gov/consumer/tips/appliances.html>. Accessed May 21, 2009.

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5. MITIGATION MEASURES PROPOSED TO MINIMIZE POTENTIALLY SIGNIFICANT ADVERSE IMPACTS OF THE PROJECT

Chapter 5 Contents	
5.1	Overview
5.2	Plans and Policies
5.3	Land Use, Agricultural Resources, and Recreation
5.4	Vegetation and Wildlife
5.5	Fisheries and Aquatic Habitat
5.6	Hydrology
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5.9	Hazards and Hazardous Materials
5.10	Cultural Resources
5.11	Visual Resources
5.12	Transportation and Circulation
5.13	Air Quality
5.14	Noise and Vibration
5.15	Utilities, Service Systems, and Public Services
5.16	Mineral and Energy Resources
5.17	Cumulative Impacts

This chapter presents mitigation measures that would reduce or eliminate the potential significant environmental impacts of the proposed Calaveras Dam Replacement Project (CDRP) identified in Chapter 4, Environmental Setting and Impacts. Each mitigation measure is numbered to correspond to the impact it addresses (e.g., Mitigation Measure 5.4.1 addresses Impact 4.4.1), except for Cumulative Impacts 5.17 which corresponds to Chapter 6.

5.1 OVERVIEW

The “Overview” subsection of Chapter 4 does not include mitigation measures; therefore, none are reproduced here.

5.2 PLANS AND POLICIES

The “Plans and Policies” subsection of Chapter 4 does not include mitigation measures; therefore, none are reproduced here.

5.3 LAND USE, AGRICULTURAL RESOURCES, AND RECREATION

MITIGATION MEASURES

5.3.6 AMGEN Tour of California

The San Francisco Public Utilities Commission (SFPUC) shall coordinate with the organizers of the AMGEN Tour of California bicycle tour to ensure that temporary road closures, haul truck traffic, and other activities related to project construction

will not interfere with the tour. Construction activities may be temporarily suspended as needed to prevent conflicts with the AMGEN tour.

5.4 VEGETATION AND WILDLIFE

MITIGATION MEASURES

5.4.1 Avoidance and Minimization Measures

The SFPUC and its contractors shall implement the following measures to avoid and minimize potential impacts of the proposed project on special status species and sensitive habitats. These measures apply to both on-site construction and off-site mitigation areas.

5.4.1a Pre-Construction Measures

- **Wetland Buffers.** Except for those areas specifically identified in Table 4.4.9, Impacts of Construction on Wetlands and Other Waters of the State and United States, where impacts cannot be practicably avoided, a minimum 100-foot buffer surrounding all wetlands, ponds, streams, drainages, and other aquatic habitats located on or within 100 feet of the project site shall be clearly designated on the final project construction plans and marked on the site with orange construction fencing or silt fence. If the area is on a slope, silt fencing or other comparable management measures will be installed to prevent polluted runoff, as well as equipment, from entering the buffer area. Signs shall be installed every 100 feet on or adjacent to the buffer fence that read, “Environmentally Sensitive Area – Keep Out.” Fencing and management measures shall be installed and inspected prior to initial project construction and maintained through the construction period. No equipment mobilization, grading, clearing, storage of equipment or machinery, vehicle or equipment washing, or similar activity, may occur until a representative of the SFPUC has inspected and approved the fencing and/or management measures installed around these features.
- **Temporary Stream Crossings.** The final project construction plans shall be designed to minimize the number of temporary stream crossings necessary for project site access and construction. Stream crossings shall be located to the maximum extent practicable in previously disturbed areas lacking riparian vegetation, pools, side ponds, or other sensitive habitat features.
- **Worker Education Program.** A worker education program shall be implemented to familiarize workers, including all vehicle operators, of the importance of avoidance of harm to special-status species and sensitive natural communities. The training shall include a discussion of the importance of maintaining speed limits and respecting exclusion zones. The SFPUC and its construction contractor shall confirm that all workers have been trained appropriately.
- **Aquatic Habitat Pre-construction Survey.** For 2 weeks prior to the commencement of work activities and immediately prior to commencement of work, a qualified biologist will survey aquatic habitat that is suitable for the

California red-legged frog, California tiger salamander, foothill yellow-legged frog, and western pond turtle and that would be affected by the project. If individuals in any life stages of these species are found, the biologist will contact the USFWS and/or California Department of Fish and Game (CDFG) to determine whether relocating any life stages is appropriate. The aquatic habitat areas that cannot feasibly be avoided during project construction (Table 4.4.9, Impacts of Construction on Wetlands and Other Waters of the State and United States), will be dewatered prior to construction (except Calaveras Reservoir). Areas that would be dewatered (assuming seasonal flows or water is present) are Pond 9 and freshwater marsh, and perennial streams, including Calaveras Creek downstream of the dam. A qualified full-time monitor will be present until ponds and streams are fully dewatered. Intake screens will not exceed a mesh size of 5 millimeters. If any of these species are found during dewatering, the qualified biologist will contact the U.S. Fish and Wildlife Service (USFWS) and/or CDFG to determine whether relocating individuals during any life stages is appropriate. The qualified biologist will remove and/or destroy any individuals of non-native species, such as bullfrogs, crayfish, and centrarchid fishes from within the dewatered habitat, to the maximum extent possible.

- **California Tiger Salamander Pre-construction Survey.** A preconstruction survey will be conducted at each work site where there would be ground-disturbing activities to identify suitable California tiger salamander burrow aestivation areas. Aestivation habitat will be defined as the presence of two or more small mammal burrows greater than 1 inch in diameter within a 10-foot-diameter area and within 10 feet of proposed construction sites (i.e., the presence of a single isolated gopher hole would not be considered habitat). As feasible within the context of the work area, aestivation areas will be temporarily fenced and avoided.

A California tiger salamander salvage and relocation plan will be prepared in coordination with USFWS and CDFG. A qualified biologist will carry out the salvage and relocation operations at construction sites where upland habitat has been identified. Surveys and trapping of California tiger salamanders will occur in the rainy season prior to construction. The effort shall be appropriately timed with respect to salamander activity for the year and proposed construction activities. Drift fences and pitfall traps within or on the perimeter of construction sites will be used to capture and relocate animals to suitable areas nearby that will not be affected by construction. USFWS trapping protocols will be followed. Exclusion fencing (described in Mitigation Measure 5.4.2, Construction Measures) will be regularly maintained and monitored until the start of and throughout construction.

- **Johnny Jump-up.** Prior to commencement of ground-disturbing activities, a qualified botanist shall flag and oversee fence installation around all stands of johnny jump-up (*Viola pedunculata*) mapped during studies for this project (ETJV 2006 and Entomological Consulting Services 2004) within the construction footprint that can be avoided. These fenced areas shall be avoided during construction.

- **Bald Eagle Pre-construction Survey.** A qualified biologist will conduct monitoring in the months of December, January, and February, before construction begins, to determine whether bald eagles are nesting at Calaveras Reservoir.

A minimum 660-foot no-disturbance buffer will be established around any active bald eagle nest near the construction site.

If an active bald eagle nest is observed within 660 feet of the west haul road, the haul route would not be used without additional coordination with USFWS and CDFG.

If the project cannot be altered to ensure that project construction, including the use of the barge haul route, would avoid potentially causing a bald eagle nest to fail, SFPUC will coordinate with CDFG and USFWS to determine whether hazing measures may be appropriate.¹ Hazing measures (e.g., frequent human activity at the nest site, use of loud noises at nest trees) would be implemented to prevent use of the nest only if egg laying had not yet commenced and would be implemented early enough in the nesting season for the eagles to use an alternate location. If hazing is not effective, a structure to exclude bald eagles from any constructed nests (e.g., a cone-shaped enclosure that would preclude eagles from accessing the nest) may be installed. Take authorization, if allowed, under the Bald and Golden Eagle Act² would be required for such measures.

- **Ground-nesting Raptor, Burrowing Owl and Northern Harrier Pre-construction Surveys.** No more than 2 weeks before construction, a survey for ground-nesting raptors, burrowing owls and northern harriers, will be conducted by a qualified biologist in suitable habitat within 500 feet of the project. Surveys will also be conducted through the reservoir refilling period in suitable habitat in the area that would be inundated by the reservoir. Surveys will conform to the protocol described by the California Burrowing Owl Consortium, which includes up to four surveys on different dates if there are suitable burrows present (Burrowing Owl Consortium 2009). This protocol would be suitable to identify northern harrier nests concurrent with burrowing owl surveys.

If occupied owl burrows or harrier nests are found within the survey area, a determination will be made by a qualified biologist, in coordination with the CDFG, as to whether or not work or refilling of the reservoir will disrupt reproduction.

If it is determined that construction will not affect occupied burrows or northern harrier nests or disrupt breeding behavior, construction will proceed without any

¹ This is a precautionary measure included in the event that a new bald eagle nest location that cannot feasibly be avoided is established within 660 feet of the project footprint prior to construction.

² Currently, there is no regulatory mechanism in place under the Bald and Golden Eagle Act that permits take of bald or golden eagles comparable to under the federal Endangered Species Act (FESA). USFWS has proposed to add a new section at Title 50 of the Code of Federal Regulations, Section 22.26, to authorize the issuance of permits to take bald and golden eagles on a limited basis. In comparison with requirements under FESA, the permitting process proposed under the Eagle Act is expected to be less burdensome to comply with while continuing to provide appropriate protection for bald and golden eagles. Take of bald or golden eagles would be authorized only where it is determined to be compatible with the preservation of bald and golden eagles and cannot practicably be avoided (USFWS 2007, p. 31141).

restriction or mitigation measures. If it is determined that construction or refilling of the reservoir will affect occupied burrows during August through February, subject owls will be passively relocated from the occupied burrow(s) using one-way doors installed at the entrance. There will be at least two unoccupied burrows suitable for burrowing owls within 300 feet of the occupied burrow (or the limit of construction or re-filling) before one-way doors are installed. Artificial burrows will be in place at least 1 week before one-way doors are installed on occupied burrows. One-way doors will be in place for a minimum of 48 hours before burrows are excavated.

If it is determined that construction will physically affect occupied owl burrows or active northern harrier nests or disrupt reproductive behavior during the nesting season (March through July), then avoidance is the only mitigation available. Construction will be delayed within 300 feet of occupied owl burrows or northern harrier nests until it is determined that the subject owls or harriers are not nesting or until a qualified biologist determines that juvenile owls or harriers are self-sufficient or are no longer using the natal burrow or nests as their primary source of shelter. Alternatively, other appropriate avoidance measures, as approved by CDFG may be implemented to ensure that the nest is protected.

If it is determined that reservoir refilling will flood occupied burrows or active nests, or disrupt reproductive behavior during the nesting season (March through July) then SFPUC will, subject to approval by CDFG, prevent the death of viable eggs or young by relocating them to an appropriate wildlife care facility or implementing other measures recommended by CDFG.

- **Other Tree-Nesting Raptor Pre-construction Survey.** A survey to identify active nests for tree-nesting raptors (other than bald eagles) will be conducted by a qualified biologist no more than 2 weeks before the start of construction at project sites from February 1 through July 30.

Active raptor nests located within 500 feet (0.25 mile for golden eagle) of the project will be mapped, to the extent allowed by access.

If an active raptor nest is found within 500 feet (0.25 mile for golden eagle) of the project, a determination will be made by a qualified biologist, in coordination with the CDFG, as to whether or not construction work will affect the active nest or disrupt reproductive behavior. Criteria used for this evaluation will include, but not be limited to, presence of visual screening between the nest and construction activities, and behavior of adult raptors in response to the surveyors or other ambient human activity. Alternatively, other appropriate avoidance measures, as approved by CDFG may be implemented to ensure that the nest is protected.

If it is determined that construction will not affect an active nest or disrupt breeding behavior, construction will proceed without any restriction or mitigation measure.

If it is determined that construction will affect an active raptor nest or disrupt reproductive behavior, then avoidance is the only mitigation available. Construction will be delayed within 300 feet (0.25 mile for golden eagle) of such

a nest until a qualified biologist determines that the subject raptors are not nesting.

In coordination with CDFG, trees with unoccupied raptor nests (excluding golden and bald eagle) may only be removed prior to March 1 or following the determination that subject raptors are not nesting.

- **Loggerhead Shrike, Grasshopper Sparrow, and Tricolored blackbird Pre-construction Surveys.** Pre-construction surveys shall be conducted by a qualified biologist, in suitable habitat, for loggerhead shrike, grasshopper sparrow, and tricolored blackbird no more than 14 days prior to the beginning of any construction activity between March 1 and August 15. The survey area shall include all potential nesting sites located within 100 feet of the area to be disturbed.

If an active nest of one of these species is found within 100 feet of the project, a determination will be made by a qualified biologist, in coordination with the CDFG, as to whether or not construction work will affect the active nest or disrupt reproductive behavior. Criteria used for this evaluation will include, but not be limited to, presence of visual screening between the nest and construction activities, and behavior of the adult birds in response to the surveyors or other ambient human activity. If construction activities have the potential to threaten the viability of an active nest discovered during the survey, then either a minimum 100-foot buffer will be flagged around the active nest and designated a construction-free zone until the nest is no longer active or other appropriate avoidance measures, including a reduced buffer size, approved by CDFG, are implemented to ensure that the nest is adequately protected. Exact implementation of this measure shall be based on specific information at the project site.

- **Swallow Exclusion.** At least 6 months prior to the start of construction, a qualified biologist shall identify swallow colonies nesting within 100 feet of construction areas. During the months of September through February, a qualified biologist shall supervise the installation of netting or screens to prevent colonies from becoming established on or near structures or cliffs that would be destroyed by construction (after verifying that no swallows would be trapped).
- **Bat Exclusion.** At least 6 months prior to the start of construction, a qualified biologist shall identify potential bat maternity sites within 500 feet of construction areas. During the months of November through February, a qualified biologist shall supervise the installation of screens at potential roosts to prevent bat use (after verifying that no bats would be trapped by screening).

If potential maternity roost sites cannot be screened in advance, pre-construction surveys shall be conducted by a qualified biologist, in suitable rock outcrop and developed habitat for Townsend's big-eared bat, pallid bat, and western mastiff bat, no more than 14 days and no less than 7 days prior to the beginning of any construction activity between March 1 and October 31. The survey area shall include all potential maternity sites located within 500 feet of the area to be disturbed.

If an active maternity site is found within 500 feet of the project, a determination will be made by a qualified biologist, in coordination with the CDFG, as to whether or not construction work will affect the site or disrupt reproductive behavior. Criteria used for this evaluation will include, but not be limited to, presence of visual and audio screening between the site and construction activities. If construction activities have the potential to threaten the viability of an active maternity site discovered during the survey, then a minimum 500-foot buffer will be flagged around the site and designated a construction-free zone until the site is no longer active or other appropriate avoidance measures, including a reduced buffer size, approved by CDFG, are implemented to ensure that the site is adequately protected. Exact implementation of this measure shall be based on specific information at the project site.

- **Most Beautiful Jewel-flower Buffer.** Before the initiation of any ground-disturbing or vegetation-clearing activities at Disposal Site 7 and Disposal Site 7 haul roads, a qualified botanist shall supervise the installation of barrier fencing on the perimeter of the work area within 200 feet of mapped most beautiful jewel-flower populations and Diablo helianthella populations. Signs shall also be installed every 100 feet on the fence line to identify the sensitive area (e.g., “Environmentally Sensitive Area – Keep Out”). No construction-related activities shall be permitted within the limits of the populations. The contractor shall maintain the fencing throughout construction of the CDRP.

5.4.1b Construction Measures

- **Wetlands and Other Waters.** Construction activities shall be avoided in saturated or ponded wetlands and streams (typically during the spring and winter) to the maximum extent practicable. Where wetlands or other water features must be disturbed, the minimum area of disturbance necessary for construction shall be identified and the area outside of that minimum area shall be avoided.
- **Exclusion Fencing.** The SFPUC shall ensure that the temporary exclusion fencing and/or other protective measures are continuously maintained until construction activities in the area of interest are completed. Exclusion fencing for establishing protective buffers shall be clearly visible (e.g., orange plastic). Barrier fencing for the California tiger salamander and Alameda whipsnake may be constructed of various materials but shall be buried deep enough (6–8 inches) and shall be tall enough (at least 24 inches above ground) to prevent the passage of target species. No construction activities, including movement of equipment, storage of materials or temporary stockpiling of spoils, will be allowed within fenced areas protecting sensitive habitats. All exclusion fencing shall be removed at the end of construction activities.
- **Wetland Soils and Vegetation.** To minimize the degradation of saturated wetland soils and vegetation where avoidance is not practicable, protective practices such as use of geotextile cushions and other materials (e.g., timber pads, prefabricated equipment pads, thick vegetative slash, geotextile fabric) and/or vehicles with balloon tires will be employed.

- **Streams and Drainages.** Stabilize banks of all streams and drainages disturbed during construction, including banks of Alameda and Calaveras Creeks, using a non-vegetative material that will protect the soil from erosion by wind or water initially and break down within a few years (e.g., jute matt). If visual evidence of erosion (e.g., rilling or scour) is observed, geotextile mats, excelsior blankets, or other soil stabilization products shall also be used.
- **Vegetation Removal.** During construction, remove trees, shrubs, debris, soils, or construction materials that are inadvertently deposited below the ordinary high-water mark of any streams, drainages, ponds, wetlands, riparian areas, and Calaveras Reservoir in a manner that minimizes disturbance of the drainage bed and bank (e.g., manually). Such materials will be set back at least 10 feet from Calaveras Reservoir and from streams, drainages, ponds, wetlands, and riparian areas that are not otherwise directly disturbed by construction.
- **Stream Crossing Locations.** Whenever possible, stream crossings shall be located on straight, relatively flat stream segments.
- **Use of Stream Crossings.** Stream crossing construction activities shall be timed to minimize impacts on wildlife and fish, including but not limited to the foothill yellow-legged frog. Installation or removal of crossings shall occur during dry conditions, preferably in summer when water flows are minimal. If necessary, stream flow shall be diverted through temporary culverts, conduits or like feature while stream crossings are being installed. Diversion culverts or conduits shall be sized to accommodate flows from flash flooding.
- **Culvert design.** Culverts for temporary stream crossings in fish-bearing streams must allow for fish passage, and the outflow of the culvert shall not create a waterfall. If possible, install and remove culverts when the streambed is dry. In a flowing stream channel, use sediment basins, a temporary diversion channel, or a dam and pump set-up to divert water during installation and removal of culverts.
- **Construction of Stream Crossings.** Temporary stream crossings constructed using temporary bridges shall have clean gravel approach ramps. Temporary culverts shall be backfilled with clean gravel/cobbles and topped with a gravel road base. Earth and rockfill material shall not be placed in stream channels. Approaches shall be stabilized using an appropriate type of geotextile covered with clean rock. Material shall extend at least 50 feet on both sides of the crossing if soft soil conditions exist or if they will be used for construction traffic during the rainy season.
- **Alameda Whipsnake Avoidance.** Vegetation clearing and initial ground disturbance activities in stands of scrub habitat that are potentially occupied by Alameda whipsnake and that cannot be avoided will be monitored by a qualified biologist. The biologist will conduct surveys and relocate any whipsnakes immediately prior to equipment clearing. Prior to clearing, escape routes that include natural vegetative cover will be provided to allow Alameda whipsnakes to move from the scrub habitat to other habitat outside of the construction area.

Stands of Alameda whipsnake scrub habitat that cannot be avoided will be hand-cleared, or a qualified biologist will do surveys and relocate any whipsnakes immediately prior to equipment clearing. Prior to clearing, escape routes that include natural vegetative cover shall be provided to allow Alameda whipsnakes to move from the scrub habitat to other habitat outside of the construction area.

Trenches or pits constructed in scrub or rock outcrop habitat will include escape ramps constructed of earthfill or wooden planks inspected by a qualified biologist to prevent entrapment of Alameda whipsnake and other animals.

SFPUC will install barrier fencing at selected locations to exclude Alameda whipsnakes from entering construction areas, haul roads, and access roads. Fencing locations will be based on observations of Alameda whipsnakes or the presence of habitats that are likely to support higher densities of this species. Other portions of the haul route and construction work areas would not be fenced, based on coordination with CDFG and USFWS. SFPUC shall monitor disturbance areas to determine whether additional fencing is necessary to minimize potential impacts.

5.4.2 Habitat Restoration Measures

The SFPUC shall restore the habitat functions and services of areas that are subject to temporary disturbance during project construction. Site restoration shall be undertaken in accordance with a detailed restoration plan or plans prepared by a qualified restoration ecologist and shall be consistent with all required permits. The final habitat restoration plan or plans shall provide, at minimum:

5.4.2a Habitat Restoration Goals and Objectives

- Restore temporary impacts on wetlands, streams and riparian habitat located above the 756-foot inundation elevation within the reservoir, as well as downstream of the replacement dam and within the limit of work at Calaveras Creek within 3 years of completion of construction.
- Restore temporary impacts on annual grasslands within the limit of work located above the 756-foot inundation elevation within 3 years of completion of construction.

5.4.2b Restoration Plan

The final habitat restoration plan(s) shall include detailed written specifications and work descriptions for the restoration projects, including, as applicable but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; sources of water, including connections to existing waters and uplands; soil properties (e.g., particle size, organic content); methods for establishing the desired plant communities; plans to control invasive plant species; dewatering information, if applicable; proposed grading plans, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream restoration, the restoration plan(s) shall also include: planform geometry; channel form (e.g., typical channel cross-sections and longitudinal profiles); stream type (i.e., ephemeral, intermittent, or perennial); location in watershed; watershed size (i.e., drainage area); mean annual precipitation; channel-forming discharge (i.e., design

discharge); and riparian area plantings. The restoration plan will be completed in coordination with applicable permitting agencies.

5.4.2c **Success Criteria, Monitoring, and Adaptive Management**

The final habitat vegetation restoration plan(s) shall include ecologically based criteria that will be used to determine whether the restoration projects are achieving identified objectives. The success criteria shall be based on attributes that are objective and verifiable. The final restoration plan(s) shall include a description of parameters to be monitored and reported in order to determine whether the restoration projects are on track to meet success criteria and whether adaptive management is needed. A schedule for monitoring and reporting on monitoring results must be included, as determined in coordination with applicable permitting agencies and/or as needed to verify whether the vegetation is fully established and self-sustaining.

5.4.3 **Compensation Measures**

The SFPUC shall compensate for unavoidable impacts on special-status species and sensitive habitats in accordance with a detailed compensation plan or plans. The compensation plan(s) shall be prepared by a qualified restoration ecologist and shall be consistent with all required permits. The final compensation plan(s) shall fully compensate for direct and indirect impacts on special-status species and for the temporal, long-term, and permanent losses of habitat areas, functions, and services and shall include: a description of the resource types and amounts that will be provided; the methods of compensation (i.e., restoration, rehabilitation, re-establishment, establishment, enhancement, and/or preservation); and the manner in which the resource functions and services of the compensation project will address the related project impacts. The final compensation plan(s) shall provide, at minimum:

5.4.3a **Compensation Goals and Objectives**

- **Wetlands and Other Waters.** Fully compensate for impacts on 4.61 acres of wetlands and open water, and 4,682 linear feet of stream habitat by restoring wetlands and streams and establishing wetland habitats at the South Calaveras and San Antonio Mitigation Areas within 5 years of completion of construction.
- **Riparian Habitat.** Fully compensate for impacts on 7.9 acres of riparian habitat by restoring and establishing riparian habitat at the South Calaveras and San Antonio Mitigation Areas within 10 years of completion of construction.
- **Oak Woodlands and Savannah.** Fully compensate for impacts on 24.0 acres of oak woodland and savannah habitat by restoring and establishing oak woodland and savannah habitat at the San Antonio Mitigation Area within 10 years of completion of construction. Impacts on oak woodlands and savannah may also be compensated for in whole or in part through a contribution to the Oak Woodlands Conservation Fund as established under subdivision (a) of Section 1363 of the Fish and Game Code.

- California Red-legged Frog Habitat.** Fully compensate for impacts on 0.11 acres and 10,366 linear feet of California red-legged frog aquatic breeding habitat, and fully compensate for any loss of breeding habitat in Alameda Creek downstream of the confluence with Calaveras Creek that may result from a potentially increased bullfrog population by improving aquatic breeding habitat through predator control in impaired water bodies in the South Calaveras Mitigation Area (SCMA) within 5 years of completion of construction, and by improving breeding habitat conditions in Alameda Creek from the Alameda Creek Diversion Dam (ACDD) to the Calaveras Creek confluence beginning with the advent of bypass flows; fully compensate for permanent impacts on 2.33 acres and 4,387 linear feet of California red-legged frog aquatic non-breeding and 656 acres of upland habitat within 5 years of completion of construction by restoring, enhancing, and protecting intermittent stream habitat at the South Calaveras and San Antonio Mitigation Areas within 10 years of completion of construction.
- California Tiger Salamander Habitat.** Fully compensate for impacts on 0.11 acres of California tiger salamander aquatic habitat by improving aquatic habitat through predator control in impaired water bodies in the SCMA within 5 years of completion of construction; fully compensate for permanent impacts to 971.6 acres of upland habitat within 5 years of completion of construction by protecting upland habitat within 1 year of completion of construction.
- Alameda Whipsnake Habitat.** Fully compensate for impacts on 33 acres of scrub/shrub habitat and 13.7 acres of rock outcrop habitat for the Alameda whipsnake by establishing scrub habitat and protecting rock outcrops at the Sage Canyon Mitigation Area within 5 years of completion of construction; fully compensate for permanent impacts to 606.9 acres of woodland and grassland habitat by protecting grasslands and woodlands adjacent to scrub at all four mitigation areas within 1 year of completion of construction.
- Callippe Silverspot Butterfly Habitat.** Fully compensate for impacts on 0.57 acres of callippe silverspot butterfly larval habitat by enhancing and protecting grasslands containing the larval host plant (*Viola pedunculata*) at the SCMA and Sage Canyon Mitigation Area within 5 years of completion of construction.
- Foothill Yellow-legged Frog Habitat.** Document that project benefits to foothill yellow-legged frog habitat in Alameda Creek from the ACDD to the Calaveras Creek confluence fully compensate for the loss of 9,421 linear feet of habitat in Arroyo Hondo, and fully compensate for any loss of breeding habitat in Alameda Creek downstream of the confluence with Calaveras Creek that may result from a potentially increased bullfrog population within 5 years of the start of bypass flows at the ACDD.
- Annual Grasslands.** Fully compensate for impacts on 418 acres of annual grassland habitat by establishing native perennial grasslands and enhancing and protecting annual grasslands at all four mitigation areas within 5 years of completion of construction.

- **Serpentine Grasslands.** Fully compensate for impacts on 13.6 acres of serpentine grassland habitat by enhancing and protecting serpentine grasslands at the Goat Rock Mitigation Area within 5 years of completion of construction.

5.4.3b Site Selection

The final compensation plan(s) shall include a description of the factors considered during the final mitigation site selection process, including consideration of watershed needs, on-site alternatives, and the practicability of accomplishing ecologically self-sustaining habitats at the mitigation sites.

5.4.3c Site Protection Instrument

The final compensation plan(s) shall include a description of the legal arrangements and instruments, including site ownership, that will be used to ensure the long-term protection of the compensation sites.

5.4.3d Baseline Information

The final compensation plan(s) shall include descriptions of the ecological characteristics of the proposed compensation sites, impact sites, and any reference sites. This shall include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a delineation of waters of the state and U.S., a map showing the locations of the impact, mitigation, and reference sites, and other site characteristics appropriate to the types of resources proposed as compensation.

5.4.3e Compensation Ratios

The final compensation plan(s) shall specify the compensation ratios for all habitat types addressed in the plan(s) needed to achieve no net loss of habitat areas, functions, and services, and the rationale used to determine these ratios. Factors considered in determining mitigation ratios shall include:

- The likelihood of success;
- Differences between the habitat functions and services lost and those expected to be provided by the compensation;
- Temporal losses of resource functions and services;
- The difficulty of restoring or establishing the desired habitat types and functions; and
- The distances between the affected habitat and compensation sites.

5.4.3f Mitigation Work Plan

The final compensation plan(s) shall include detailed written specifications and work descriptions for the compensation projects, including, but not limited to: the geographic boundaries of the projects; construction methods; timing and sequence; sources of water, including connections to existing waters and uplands; soil properties (e.g., particle size, organic content); methods for establishing the desired plant communities; plans to control invasive plant and animal species; dewatering

plans; proposed grading plans, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream habitat compensation projects, the work plan shall also include: planform geometry; channel form (e.g., typical channel cross-sections and longitudinal profiles); stream type (i.e., ephemeral, intermittent, or perennial); location in watershed; watershed size (i.e., drainage area); mean annual precipitation; channel-forming discharge (i.e., design discharge); and riparian area plantings.

5.4.3g Maintenance Plan

The final compensation plan(s) shall include a description and schedule of maintenance requirements to ensure the continued viability of the habitats once initial construction is completed.

5.4.3h Success Criteria

The final compensation plan(s) shall include ecologically based criteria that will be used to determine whether the compensation projects are achieving their objectives. The success criteria shall be based on attributes that are objective and verifiable.

5.4.3i Monitoring Plan

The final compensation plan(s) shall include a description of parameters to be monitored to determine whether the compensation projects are on track to meet performance standards and whether adaptive management is needed. Suitable reference sites may be identified in which case the criteria used to select the reference sites shall be provided. Monitoring may include collaboration with relevant ongoing studies (e.g., Alameda Creek foothill yellow-legged frog and California red-legged frog monitoring by the East Bay Regional Parks District). A schedule for monitoring and reporting on monitoring results must be included.

5.4.3j Long-term Management Plan

The final compensation plan(s) shall include a description of how the compensation sites will be managed after the performance standards have been achieved to ensure the long-term sustainability of the resources, including long-term financing mechanisms and the party responsible for long-term management.

5.4.3k Adaptive Management Plan

The final compensation plan(s) shall include a management strategy to address unforeseen changes in site conditions or other components of the compensation projects, including the party or parties responsible for implementing the adaptive management measures. The adaptive management plan will guide decisions for revising the final compensation plan(s) and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect mitigation success. Adaptive management actions may include the purchase of mitigation credits from an approved mitigation bank.

5.4.3l Financial Assurances

The final compensation plan(s) shall include a description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that

the compensation projects will be successfully completed in accordance with the performance standards.

IMPACTS OF IMPLEMENTING PROPOSED MITIGATION

Implementation of certain mitigation measures identified above (i.e., amphibian monitoring, management of callippe silverspot habitat and serpentine grasslands) would have no impacts on the environment. However, wetland mitigation, California red-legged frog and California tiger salamander predator control, and other habitat creation and restoration actions would require the use of mechanized equipment in sensitive habitats, and the dewatering of aquatic habitat and could affect special-status species and water quality. Mitigation for wetlands and waters of the United States has been designed to be self mitigating but could have temporary construction-related impacts; these will be minimized and avoided through the prevention of the discharge of pollutants and by incorporating measures to protect and maintain water quality described in Mitigation Measure 5.7.1. Impacts on sensitive wildlife would be avoided through the pre-construction surveys and avoidance measures for the California red-legged frog, California tiger salamander, and western pond turtle described in Mitigation Measure 5.4.1. Temporary impacts will be restored by incorporating measures described in Mitigation Measure 5.4.2. Sensitive resources present in or near the proposed South Calaveras, San Antonio, Sage Canyon, and Goat Rock Mitigation Areas, and that could be affected by mitigation activities, are identified in Table 5.1.

The San Antonio, Goat Rock, and Sage Canyon and South Calaveras Biological Mitigation Areas are located within an archaeologically sensitive region. There is a substantial probability that archaeological resources, if located at or near the ground surface, could be disturbed by various habitat creation, restoration, and enhancement activities that may take place in one or more of these areas (e.g., digging holes for plantings; removal of invasive plant species, installation of fencing; installation of water delivery systems; reconstruction of embankments; grading for stream and drainage restoration; grading for new access roads; and removal of existing road remnants). Disruption of archaeological resources, if present within the Biological Mitigation Areas, could impair the potential of such resources to yield information important to prehistory and history.

An Archaeological Survey Report (ASR) for the Biological Mitigation Areas (the “ASR Addendum”) has been prepared by URS Corporation (URS 2009) to cover the Biological Mitigation Areas, which were added to the CDRP subsequent to the initial survey of the CDRP

Table 5.1: Sensitive Biological Resources That Could Be Affected by Mitigation Activities

Resource	South Calaveras Mitigation Area	Sage Canyon Mitigation Area	San Antonio Mitigation Area	Goat Rock Mitigation Area	Mitigation
Wetlands and Waters of the state and U.S.	X	X	X	X	5.4.1 – Avoidance or minimization of impacts through permit conditions; prevention of pollutant discharge 5.4.2 – Restoration of temporary impacts
California red-legged frog	X		X		5.4.1 – Pre-construction avoidance and minimization 5.4.2 – Restoration of temporary impacts to habitat
California tiger salamander	X		X	X	5.4.1 – Pre-construction avoidance and minimization 5.4.2 – Restoration of temporary impacts to habitat
Alameda whipsnake	X	X	X		5.4.1 – Avoidance and minimization of effects and monitoring of construction 5.4.2 – Restoration of temporary impacts to habitat
Foothill yellow-legged frog	X		X		5.4.1 – Avoidance of direct effects
Western pond turtle	X		X		5.4.1 – Avoidance of direct effects; worker education 5.4.2 – Restoration of temporary impacts to habitat
Nesting raptors	X	X	X	X	5.4.1 – Pre-construction surveys; nest avoidance
Upland Species of Special Concern and Migratory Birds	X	X	X	X	5.4.1 – Minimization of effects on habitat; minimization of impact 5.4.2 – Restoration of temporary impacts to habitat

Cultural Resources Study Area. The ASR Addendum conducted a literature review, a geoarchaeological sensitivity assessment, and an archaeological and built environment pedestrian survey. The ASR Addendum identified, recorded, and evaluated seven isolated historic-era features and three isolated prehistoric features. Habitat restoration activities have been redesigned so that ground-disturbing activities would avoid potentially significant features identified within Sage Canyon. The ASR Addendum concludes that “the remaining isolated artifacts do not appear to retain the values that would make them eligible for inclusion in the CRHR [California Register of Historical Resources] or NRHP [National Register of Historic Places].” Additionally, “the types of project activities proposed within these [Biological Mitigation] areas would be unlikely to affect these resources.” The impact of habitat creation, restoration and enhancement activities within the Biological Mitigation Areas on known cultural resources would therefore be less than significant.

Unknown archaeological resources may be accidentally disrupted during habitat restoration, creation and enhancement activities within the Biological Mitigation Areas. See Section 4.10.2.3, Cultural Resources, Impact 4.10.2: Impact of Construction Activities on Unknown Archaeological Resources. Implementation of Mitigation Measure 5.10.2, Accidental Discovery Measures, would identify and preserve the information potential of archaeological resources in the event of accidental discovery, and thereby reduce potential impacts of construction on unknown archaeological resources to a less-than-significant level.

5.5 FISHERIES AND AQUATIC HABITAT

MITIGATION MEASURES

5.5.1 Native Fish Capture and Relocation

Prior to commencement of construction downstream of the existing dam, a qualified biologist shall capture and relocate native fish within the dam construction impact area and downstream approximately 100 feet. All captured native fish species shall be immediately released to a suitable habitat near the project site. The qualified biologist shall place nets with 1/8-inch mesh at the downstream extent to keep fish out of the area during fish removal activities. A small cofferdam shall be constructed at the lower end of the work area, and the work area shall then be dewatered. Fish rescue and relocation shall continue until the area is completely dewatered, or until it is determined that no fishes remain in the dewatering area.

5.5.5a Resident Rainbow Trout Monitoring

The SFPUC shall develop and implement a Resident Rainbow Trout Monitoring Plan in consultation with CDFG and NMFS. Monitoring results shall be provided to the resource agencies as requested. Monitoring shall occur for a minimum of 5 years and a maximum of ten years following completion of the CDRP. At the completion of the monitoring period, the SFPUC shall produce a draft comprehensive report describing the methods, data collected, and results used to assess the performance of

the minimum streamflow in providing suitable habitat for resident trout spawning and egg incubation. The Resident Rainbow Trout Monitoring Plan may be modified by or combined with any future steelhead monitoring requirements.

If monitoring indicates that the bypass flows at the ACDD and flow releases at Calaveras Dam provided as part of the CDRP are adequate to sustain the resident trout population in Alameda Creek downstream of the ACDD, then no additional mitigation action would be required. If monitoring indicates that this measure does not sustain the resident trout fishery in this reach, then the SFPUC shall implement Measure 5.5.5b, Resident Rainbow Trout Adaptive Management.

5.5.5b Resident Rainbow Trout Adaptive Management

If monitoring results for Measure 5.5.5a, Resident Rainbow Trout Monitoring, indicate that the bypass flows at the ACDD and flow releases at Calaveras Dam provided as part of the CDRP do not sustain the resident trout population in Alameda Creek downstream of the ACDD, then the SFPUC shall also implement additional measures as follows: modify the flow release schedules, implement seasonal restrictions on Alameda Creek diversions to Calaveras Reservoir to protect the downstream resident trout fishery during the spawning period (December 1 through April 30), or install and operate a fish passage barrier to “screen” the diversion facility (screening could consist of a behavioral barrier, such as electrical or sound barrier that deters fish, or a physical barrier – such as a screen facility). Modification of the flow release schedules for resident rainbow trout will be consistent with any future flow release schedules for steelhead.

SFPUC shall consult with the appropriate resource agencies, including CDFG, to first review the monitoring results for Measure 5.5.5a and determine the need for any further mitigation actions. If needed, SFPUC will either (a) consult with the appropriate resource agencies to develop additional flow releases, and/or seasonal restrictions on diversions (this could involve modifying the flow release schedules, establishing a set annual time period for diversion restrictions, or annual monitoring of fishery conditions that would then trigger implementation of diversion restrictions); or (b) implement a fish passage barrier if determined to be feasible. During the monitoring and evaluation period for Measure 5.5.5a, the SFPUC will evaluate the feasibility of installing and operating a fish passage barrier. The feasibility study will include an engineering evaluation of the existing site and diversion structure, access for construction and power supplies to the site, the application of various alternative designs, and identification of a preferred design if determined to be feasible. If it is determined that a fish passage barrier is needed to protect resident trout at the diversion structure then engineering design will be completed and be sufficiently detailed to allow permitting and completion of construction within a period of 24 months after the date that the additional mitigation is determined to be required.

5.6 HYDROLOGY

MITIGATION MEASURES

None are required.

5.7 WATER QUALITY

MITIGATION MEASURES

5.7.1 Storm Water Pollution Prevention Plan

Consistent with the requirements of the State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction Activity, the SFPUC shall undertake the proposed project in accordance with a project-specific Storm Water Pollution Prevention Plan (SWPPP). The San Francisco Bay Regional Water Quality Control Board (RWQCB), the primary agency responsible for protecting water quality within the project area, is responsible for reviewing and ensuring compliance with the SWPPP. This review is based on the general permit issued by the State Water Resources Control Board.

The recommended Best Management Practices (BMPs), subject to review and approval by the RWQCB, include the measures listed below. However, the measures themselves may be altered, supplemented, or deleted during the RWQCB's review process, since the RWQCB has final authority over the terms of the SWPPP.

Scheduling

- Implement BMPs year-round during wet and dry weather.
- Include a wet-weather contingency plan stating which BMPs will be used.
- Include a schedule for BMP implementation that accounts for any time lag between initial application of certain BMPs (such as stabilizers, hydroseeding) and effective stabilization.
- Do not allow placement of fill or excavation in Borrow Area E from mid-December to mid-March, unless conditions are suitable (i.e., dry).
- Schedule and sequence construction activities to minimize the areal extent and duration of site disturbance at any time.

Preservation of Existing Vegetation

- Provide work exclusion zones outside of work areas to protect vegetation and to minimize the potential for removing or injuring trees, roots, vines, shrubs, and grasses.
- Avoid disturbance of riparian and wetland vegetation by installing flagging and temporary fencing.

- Document the amount, type, and quality of removed wetland and riparian vegetation and its condition during the maintenance period and at the time of replanting.
- At the disturbed riparian and wetland sites, cover cleared areas with mulches or protective mats, install silt fences near remaining riparian areas and streams to control erosion and trap sediment, and reseed cleared areas with native vegetation.

Erosion and Sediment Controls

- Use berms, ditches, or other structures to divert natural surface runoff around construction areas.
- Install fiber rolls, straw-wattles, coir logs, silt fences, or other effective devices along drainage channels to prevent soils from moving into creeks.
- Install check dams, level spreaders, water bars, rock outlet protection for culverts, grade stabilization structures, or other devices to slow the velocity of stormwater runoff and reduce erosion potential.
- Install sediment control devices during construction, including but not limited to silt fences, check dams, ponds, and basins.
- Locate sediment traps to obtain the maximum storage benefit from the terrain, and to facilitate cleanout and disposal of the trapped sediment.
- Dispose of sediment removed from traps, ditches, and culverts in the spoils disposal sites.
- Maintain access roads throughout the construction period.
- Stabilize temporary roads and construction entrances to minimize erosion and prevent mud and dirt from being tracked off site.
- Locate stockpiles at least 50 feet from creeks, drainage channels, and drainage swales, whenever possible.
- Install fiber rolls, straw-wattles or silt fencing between stockpiles and creeks, drainage channels, and drainage swales.
- Use silt fences or silt curtains when fill placement or excavation is adjacent to or in Calaveras Reservoir.

Slope Protection

- After excavating any open-cut slopes, install slope protection measures such as fiber rolls, drainage ditches, or erosion control fabrics to minimize the potential for concentrated surface runoff to cause erosion. (Not applicable to work at finished rock faces.)

- Stabilize vertical to nearly-vertical rock faces that are unable to support vegetation by cleaning the slopes of loose debris and benching them for stability.

Temporary Stream Crossings

- Construct temporary stream crossings using a temporary bridge with gravel approach ramps or temporary culverts backfilled with clean gravel/cobbles and topped with a gravel road base.
- Do not place earth and rockfill material in stream channels.
- Upon completion of the project, remove or stabilize temporary stream crossings with banks graded to a stable angle.

Wind Erosion Control

- Implement wind erosion or dust control procedures consisting of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. The contractor may choose to cover small stockpiles or areas as an alternative to applying water or other dust palliatives.
- Reduce wind speeds at the surface of soil stockpiles by erecting a windscreen or by changing the pile orientation or shape if covering piles is not practicable (i.e., when access to the pile is necessary).
- If runoff water could discharge to receiving waters, require that dust palliatives or tackifiers be ANSI/NSF 60–certified (Drinking Water Treatment Chemicals – Health Effects).
- Control water application rates to prevent runoff and ponding. Repair leaks from water trucks and equipment immediately.

Treatment Controls

- In order to meet the Basin Plan water quality objectives, install turbidity barriers and collect and treat drainage and runoff water from any part of the work area that has become turbid with eroded soil, silt, or clay to reduce turbidity prior to discharge to receiving waters.
- Use only certified ANSI/NSF 60 (Drinking Water Treatment Chemicals – Health Effects) coagulants or flocculants for treatment unless otherwise approved by the RWQCB. Review information on the effects of the coagulant or flocculant on aquatic life prior to selection.
- For naturally occurring asbestos (NOA)-containing areas, treatment may include coagulation/flocculation (if necessary), sedimentation, and filtration. For non-NOA/metals-containing areas, treatment may include only sedimentation.
- Prepare a dewatering plan prior to excavation.

- Impound dewatering discharges in sediment retention basins or other holding facilities to settle the solids and provide treatment prior to discharge to receiving waters as necessary to meet Basin Plan water quality objectives.
- Locate sediment retention basins a minimum of 50 feet from surface waters, creeks, drainage channels, and drainage swales, whenever possible.
- An off-site project may be required if an unusual storm event occurs and water discharges have not settled to avoid significant sedimentation from reaching Alameda Creek or its tributaries. Off-site erosion control projects may include gully repairs, stream bank stabilization, slide repairs, or other actions acceptable to the RWQCB. The RWQCB may determine through the permitting process that an off-site erosion control project within the Alameda Watershed could be required to offset impacts on water quality. The RWQCB will determine appropriate drainage and runoff treatment controls as part of the SWPPP review and 401 Water Quality Certification permitting process.

Hazardous Materials

- Keep hazardous materials and other wastes at least 100 feet from wetlands, creeks, drainage channels, and drainage swales, whenever possible.
- Store hazardous materials in areas protected from rain, and provide secondary containment to prevent leaks or spills from affecting water quality.
- Implement the following hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants:
 - Develop and implement strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways.
 - Conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel. Collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility.
 - Maintain controlled construction staging, site entrance, concrete washout, and fueling areas a minimum of 100 feet from stream channels or wetlands whenever possible to minimize accidental spills and runoff of contaminants in stormwater.
 - Prevent raw cement; concrete or concrete washings; asphalt, paint, or other coating material; oil or other petroleum products; or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.
 - Maintain spill cleanup equipment in proper working condition. Have spill kits and cleanup materials available at all locations of drilling and pile driving, as applicable. Clean up all spills immediately according to the spill prevention, control, and countermeasure plan, and immediately notify the CDFG and the RWQCB of any spills to waterways and cleanup procedures.

- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Inspect on-site vehicles and equipment daily at start-up for leaks, and repair any leaks immediately.

Hazardous Materials Handling Near Water (includes measures for barges, if selected)

- In the SWPPP, specify appropriate construction and material transportation and stockpiling practices to reduce the potential for discharging sediment and other construction materials into Calaveras Reservoir or for increasing turbidity related to barging and the construction of temporary docking facilities (if used):
 - When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runoff and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.
 - Place drip pans under all vehicles and equipment on docks, barges, or other structures over water bodies when the vehicle or equipment is expected to be idle for more than 1 hour.
 - Identify types of spill control measures to be employed, including the storage of materials and equipment. Ensure that staff is trained regarding the use of the materials, deployment and access of control measures, and reporting measures.
 - Use suction dredging, if feasible, to construct barge access channels.
 - Install a turbidity barrier around the work area during lane dredging and during the installation of jetties or docks and anchors.
 - Place dredged material directly into haul trucks that will dispose of the materials. Use lined haul trucks to prevent leaks or spills of sediment-laden water from dredged material. Do not allow temporary storage or dewatering of dredged spoils on site.
 - Test dredged materials during construction, and dispose of contaminated materials only at approved disposal facilities.
 - Establish and enforce barge and tugboat speeds and no-wake zones to decrease erosional energy and turbidity.
 - Maintain equipment that is stored or used in streambeds or on docks, barges, or other structures over water bodies to prevent leaks of oil, grease, fuel, coolants, and hydraulic fluids.
 - Secure all materials on the barge to prevent discharges to receiving waters via wind.
 - Install steel decking over the barge pontoons to minimize the potential for clay materials to fall into the reservoir during transport and loading.

- Use sideboards to confine the clay materials on the barge and prevent the material from falling off the edge of the barge.
- Perform loading and unloading of the barges within designated areas that are isolated from the rest of the reservoir by turbidity barriers.

Solid Waste Management

- Specify solid waste management practices to prevent the discharge of pollutants to stormwater from solid waste.
- Select designated waste collection areas on site.
- Provide an adequate number of waste containers with lids or covers that can be placed over the container to keep rain out or to prevent the loss of wastes when it is windy.
- Arrange for regular waste collection before containers overflow, especially during rainy and windy conditions.

Equipment Maintenance

- Fuel, maintain, and park vehicles and equipment at least 100 feet from wetlands, creek channels, and drainage swales unless adequate measures have been taken to assure that petroleum products, hydraulic fluids, or other waste products are not discharged to wetlands, creeks, or storm drainage facilities. If dam foundation excavation operations, drilling and grouting operations, or barging require fueling or emergency maintenance activities near or on water bodies, the following measures will be taken to ensure that petroleum products, hydraulic fluids, or other waste products are not discharged to surface water or groundwater:
 - Check and maintain any equipment or vehicle driven and/or operated adjacent to a wetland or creek channel daily to prevent leaks.
 - If it is necessary for maintenance purposes to drain and replace fluids on site, collect the spent fluids using drip pans and drip cloths, store these items in separate labeled containers, and disposed of them properly (recycled when possible).
 - Provide secondary containment for fueling and maintenance to prevent leaks and spills from affecting water quality.

Equipment Washing

- Do not discharge water from equipment washing into drainages, or allow it to percolate into the ground.
- Wash equipment off site, except when on-site washing is required to reduce hazards associated with NOA. If equipment must be washed on site, then only water may be used. Do not use soaps, solvents, degreasers, steam cleaning, or other similar products or methods unless all of the discharge is collected for appropriate off-site disposal.

- Wash equipment used in NOA-containing areas with water and brushes or a wheel wash system prior to entering non-NOA-containing areas, as required in the asbestos dust mitigation plan. Wheel wash systems will use water without solvents.
- After water from equipment or wheel washing has been treated with an oil/water separator and for turbidity/sediment removal, allow the water to be used for dust control or to percolate into the ground away from water bodies.

Material and Equipment over Water

- Use, store, and dispose of materials and equipment on barges, boats, temporary construction pads, or similar locations using appropriate procedures that minimize or eliminate the discharge of potential pollutants to a watercourse.

Material Delivery and Storage

- Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials on site, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

Post-Construction Site Restoration and Stabilization

- Upon project completion, return the project site to its general condition before construction, including re-grading the site and re-vegetating disturbed areas.
- Prepare and implement a detailed re-vegetation plan to ensure that appropriate plant cover becomes established in disturbed areas. This plan will identify measures to establish vegetation by planting, seeding, and irrigation, if necessary. The restoration plan will specify slope inclination and permanent drainage swales and berms to mitigate erosion of the disposal fills.
- Grade the final borrow area and disposal area slopes as flat as possible and bench them to control runoff. Upon completion of the project, remove all construction debris and associated materials from the work site.
- Inspect haul roads and staging areas for visible staining from spills or leaks of oil, grease, fuel, or other contaminants and remove any contaminated soils from inundation areas prior to refilling the reservoir.

Inspection and Maintenance

- Inspect all disturbed sites in the first week of October and no later than October 15 to document that all erosion and sediment control BMPs have been installed properly according to the BMP requirements.
- During the rainy season (October 15 through April 15), inspect all erosion and sediment control measures at least biweekly on sites with a low erosion hazard and weekly on slopes that are 15 percent or greater and in areas with highly erosive soils.

- After the first storm of record, inspect all erosion and sediment control measures daily, during and after each storm event.
- Repair breaches in erosion and sediment control devices at the close of each day and whenever rain is forecasted.
- Repair or replace erosion control devices after each rainstorm.
- Inspect sediment retention basins every working day.
- Stockpile at the site sufficient devices and materials (e.g., silt fencing, fiber rolls, straw bales, erosion mats, sand bags, gravel, plastic sheeting, soil tackifiers, flocculants, biker tanks, and pumps) to enable immediate repair or replacement of failed BMPs.
- Immediately correct and report any failure, deficient performance, or improper installation of any control measures.
- Maintain access roads throughout the construction period.
- Regularly inspect all haul road surfaces to ensure that a gravel surface cover is maintained in good condition throughout the construction period. Immediately repair ruts, worn water bars and washed-out areas if identified.

Monitoring and Reporting

- For real-time information, use turbidity measurements during construction as a surrogate for asbestos measurements.
- Monitor turbidity downstream of the project to assess the effectiveness of control measures and protect water quality. Specify site-specific monitoring methods in the SWPPP.
- Treat all elevated levels of turbidity, asbestos, and metals to bring them within the established water quality standards in force at the time of occurrence.
- Notify the RWQCB, Alameda County Water District, Alameda County Environmental Health Services Department, and East Bay Regional Park District in the event of elevated turbidity or a spill or release of contaminants, NOA, or metals to any waterways in the Alameda Creek system.

5.7.2 Drilling Fluids

If drilling muds/fluids are used for drilling operations, the SFPUC will ensure that drilling fluids contain only water and bentonite or similar inert substances (i.e., contain no environmental pollutants) and that any drilling fluids used are properly contained. If on-site containment and dewatering methods are used, the SFPUC and its contractors will ensure the contained materials are not susceptible to runoff during storms. Barriers (e.g., silt fence or berm) will be installed to prevent discharge of drilling fluids to receiving waters. Drilling fluids will be dewatered on site if approved by regulatory permitting agencies and/or properly disposed of off site.

The SFPUC or its contractor will prepare and implement a Drilling Contingency Plan to manage the inadvertent release, or “frac-out,” of drilling fluids. If the contractor prepares the plan, it will be subject to approval by the SFPUC before drilling work can begin. The Drilling Contingency Plan will include measures to minimize the potential for a frac-out (e.g., pre-planning of the drilling profile based on ground conditions so that the potential for a release of fluids is minimized); provide for the timely detection of frac-outs; and ensure an organized, timely, and “minimum-impact” response in the event of a frac-out and release of drilling fluid.

Specifically, the Drilling Contingency Plan will require, at a minimum, the following measures and content:

- The contractor will provide a monitor on site during drilling operations to look for observable inadvertent releases or frac-out conditions or lowered pressure readings on drilling equipment that may indicate a potential frac-out.
- If the contractor and/or drill-rig operator suspects a frac-out (e.g., notices a loss of circulation of drilling fluid and cuttings do not show a large quantity of gravel) or drilling fluid is observed at the surface, the contractor will implement measures to stop the frac-out, such as reducing the drilling pressure or thickening the drilling fluid (e.g., by using less water). If measures to stop frac-out are not successful, all drilling work will stop, including the recycling of drilling fluid, until the location and extent of the frac-out can be determined and remedied.
- If the drilling fluid does not surface, no other actions will be taken.
- If the drilling fluid surfaces, the affected area will be surrounded with a barrier (e.g., berm and/or silt fence) to prevent discharge of the fluid to surface waters. If the drilling fluid is released into surface waters and there is a visible plume, a sediment boom or curtain will be installed downstream of the frac-out to attempt to capture the released drilling fluid. The drilling fluid will then be removed using the minimum amount of equipment needed (e.g., manually or by suction hose using a vacuum truck) in order to minimize impacts on the surface area where the frac-out occurred.
- If the response measures described above contain the frac-out, drilling may resume.
- The SFPUC will ensure that the Drilling Contingency Plan also includes procedures for notification of and reporting of frac-outs to applicable regulatory agencies (i.e., Regional Water Quality Control Board, Alameda County Water District).

5.8 GEOLOGY, SOILS, AND SEISMICITY

MITIGATION MEASURES

5.8.3 Geotechnical Evaluation for Disposal Site Stabilization

A geotechnical evaluation shall be completed for reserve Disposal Site 5 if the fill placement creates final slopes greater than 20 feet high. The analysis shall address static stability, hazards from fault offset, drainage, erosion control, and grading requirements. The investigation and analysis shall be coordinated with the civil engineering design of the disposal site and shall be completed under the direction and oversight of a California-licensed Geotechnical Engineer. The geotechnical investigation report shall be reviewed and approved by SFPUC Engineering Management Bureau. All measures specified for design and construction of the fills shall be implemented by the construction contractor.

5.9 HAZARDS AND HAZARDOUS MATERIALS

MITIGATION MEASURES

5.9.1 Groundwater at Former Calaveras Test Site

The SFPUC shall notify the San Francisco Bay RWQCB of planned excavation activities in the vicinity of the former Calaveras Test Site and shall implement the monitoring requirements specified by the RWQCB to demonstrate that excavation activities in Borrow Area E do not adversely affect the groundwater plume at the former Calaveras Test Site and to detect the presence of previously unidentified soil or groundwater contamination, if encountered. The monitoring requirements and potential response actions, should monitoring identify effects on the groundwater plume or previously unidentified contamination, shall be specified in a contingency plan prepared by the construction contractor for review by the SFPUC. The contingency plan shall identify potential response actions, such as segregation, testing, and treatment of affected soil and groundwater.

5.9.2a Dust Mitigation Plan and Comprehensive Air Monitoring Plan

The SFPUC shall prepare an asbestos Dust Mitigation Plan for approval by Bay Area Air Quality Management District (BAAQMD) as required in Section 93105 of Title 17 of the California Code of Regulations, "Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations." The Dust Mitigation Plan shall specify site-specific measures that would be taken to minimize emissions of NOA and metals-containing dust and to ensure that asbestos and metals (including chromium, nickel, arsenic, copper, and cobalt) concentrations do not exceed regulatory-approved risk-based trigger levels at the air monitoring perimeter of work limits during construction. The SFPUC shall include all applicable dust mitigation measures set forth in the Dust Mitigation Plan in the construction contract for the project.

The SFPUC would also engage a third party consultant that would provide review and monitoring of the construction contractor's air monitoring activities, other NOA-

related construction contractor worker protection measures, and the construction contractor's NOA soil and rock evaluations for compliance with contract requirements. The consultant would also conduct the comprehensive air monitoring required by Comprehensive Air Monitoring Plan (described below). The third party consultant would be qualified in ambient air monitoring under the supervision of a Certified Industrial Hygienist who is also a California Certified Asbestos Consultant.

Examples of dust control measures that may be implemented include the measures identified in the Asbestos Airborne Toxics Control Measure (ATCM), as well as project-specific measures to be included in the Dust Mitigation Plan. As provided for in the Asbestos ATCM, alternative measures that provide an equivalent level of dust control may be included in the Dust Mitigation Plan subject to BAAQMD authorization. The Asbestos ATCM includes the following dust control measures for construction activities in NOA containing areas:

- Restriction of vehicle speeds on on-site unpaved roads, staging areas, and parking lots to 15 miles per hour; as well as wetting, use of a chemical dust suppressant, or use of a gravel cover containing less than 0.25 percent asbestos or other effective measures in these areas to control dust generation;
- Wetting of work surfaces prior to and during construction activities and suspension of grading operations when wind speeds are high enough to result in visible dust emissions crossing the air monitoring perimeter of work limits;
- Wetting or use of a cover to control dust from active storage piles;
- Wetting, use of a chemical dust suppressant, use of a cover (such as a tarp or vegetative cover), establishment of a surface crusting, use of wind barriers or other effective measures to control dust from inactive storage piles and inactive work areas;
- Cleaning of all visible track-out on paved public roads at the end of the work day or at least once per day;
- Implementation of track-out prevention measures such as a gravel pad, wheel wash system, use of a paved approach, or other equally effective measures to prevent and control track-out to a public road;
- Loading of trucks for off-site transport of NOA-containing materials such that no spillage could occur, as well as wetting the load and either covering it with a tarp or loading the truck such that material does not touch the front, back, or sides of the cargo compartment at any point less than 6 inches from the top and that no point in the load extends above the top of the cargo compartment; and
- Post-construction stabilization of disturbed areas with vegetative cover, placement of at least 3 inches of non-asbestos containing material, paving, or any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions.

The Dust Mitigation Plan may also include additional project-specific dust control actions for general construction activities, drilling, blasting, rock processing, tunneling, and dam foundation cleaning activities to prevent NOA and metals from migrating beyond the project site boundaries. These actions include:

- Washing of equipment used in NOA-disturbing activities after use and prior to removing it from the site;
- Sweeping all paved access roads, parking areas, and staging areas daily;
- Reducing wind speeds to soil surfaces (by using a wind screen or changing the shape or orientation of the stockpile) to control dust from active storage piles;
- Drilling with water in NOA-containing areas;
- Restricting blasting activities in areas of NOA and metals to Monday through Friday;
- Wetting blast areas as feasible, before, during, and after the blast;
- Using blasting blankets as feasible;
- Continuous misting or using an equivalent water application technique during the cleaning of the dam foundation and processing of earth and rockfill materials for the new embankment where NOA- and metals-containing rock is present;
- Wetting the adit and shaft work surfaces and materials when tunneling in NOA and metals-containing rock, as well as materials derived from these activities;
- Prohibiting the use of compressed air for drilling and foundation cleaning and the use of jack hammers for any activities disturbing NOA-containing rocks unless measures are implemented to capture or control airborne dust generated by the process;
- Applying water whenever NOA-containing materials are being removed from the tunnel or adits by mechanical processes such as shovels, excavator buckets, and hydraulic breakers; and/or
- Using a treatment system such as a baghouse or HEPA-type filtering device to remove NOA-containing dust from the tunnel exhaust air.

The measures in the Dust Mitigation Plan may be altered, supplemented, or replaced during the BAAQMD's review process, since the BAAQMD has final authority over the terms of the Dust Mitigation Plan.

The SFPUC shall prepare a Comprehensive Air Monitoring Plan that would describe monitoring that would be conducted to demonstrate compliance with the Asbestos ATCM. The plan would specify two types of monitoring: 1) air monitoring to be conducted at the air monitoring perimeter; and 2) construction activity area monitoring of specific cells of construction activity within the work limits to provide

an added level of analysis and control of dust generation during construction. Close monitoring of construction activity cells will provide information to demonstrate whether the generation of dust is being effectively controlled at the source, before it reaches the work limits, providing valuable information regarding the contractor's dust control measures in each cell while monitoring at the perimeter of the work limits would be used to demonstrate compliance with the Asbestos ATCM.

The Comprehensive Air Monitoring Plan would specify the location(s) and frequency of perimeter monitoring, and risk-based trigger levels of asbestos and metals (including chromium, nickel, arsenic, copper, and cobalt) that would be protective of off-site receptors (e.g., recreational users of Calaveras Road and/or nearby trails in the Sunol Wilderness area, as well as workers stationed in the Sunol Wilderness), and corrective actions to be taken should the acceptable level of asbestos or metals be exceeded at any monitoring location. Should trigger levels be exceeded at a perimeter monitoring location, the SFPUC would notify Alameda County, East Bay Regional Parks District, and other applicable entities to coordinate activities that may include closure of the affected road or trail, investigate the cause of the exceedance, and implement corrective actions such as implementation of enhanced dust suppression techniques. Should corrective action fail to bring asbestos or metals concentrations to within acceptable limits, the Comprehensive Air Monitoring Plan would require the contractor to modify or temporarily halt construction activities in areas generating excessive dust until dust generation could be maintained within acceptable levels. Affected roads and trails would not be reopened until monitoring indicated that asbestos and metals concentrations are within acceptable limits.

Should trigger levels be exceeded in the tunnel emissions, the SFPUC would investigate the cause of the exceedance, and implement corrective actions such as implementation of enhanced dust suppression techniques or additional emission controls. Should corrective action fail to bring asbestos concentrations to within acceptable limits, the Comprehensive Air Monitoring Plan would require the contractor to reduce or stop tunneling in areas generating excessive dust until dust generation could be maintained within acceptable levels.

Both the Dust Mitigation Plan and Comprehensive Air Monitoring Plan would be subject to review and approval by the BAAQMD prior to the start of construction.

5.9.2b Construction Worker Protection

The construction contractor shall implement the asbestos monitoring provisions specified in California Code of Regulations Title 8, Section 1529 (8 CCR 1529), Construction Safety Orders, Asbestos, regulated by the California Division of Occupational Safety and Health (Cal/OSHA), and shall include those provisions in accord with Cal/OSHA for the CDRP to provide additional worker protection measures. These additional measures would be included as additional contract requirements in the construction contract and would be subject to review and monitoring of the SFPUC's third party consultant identified under Mitigation Measure 5.9.2a. Additional measures include, but are not limited to, the following items:

- The construction contractor shall provide a Certified Industrial Hygienist who is also a Certified Asbestos Consultant who would be responsible for all aspects of design and implementation of its Personal Air Monitoring program. Contractor personnel will also be Certified Asbestos Consultants or Site Surveillance Technicians under the supervision of a Certified Asbestos Consultant. The construction contractor will implement focused site-specific training under Certified Industrial Hygienist supervision.
- The construction contractor shall provide a California Professional Geologist who oversees all determinations of lithological changes during construction.
- The construction contractor shall perform extended initial exposure assessments in a manner that would evaluate both work activities and area specific lithological effects on a regular and frequent basis, including of evaluation of potential exposure on adjacent work areas. The results of these evaluations will be immediately provided to the City's third party consultant.
- During construction, workers will be required to implement additional engineering controls and don personal protective equipment for worker respiratory protection based on the results of the extended initial exposure assessments. The trigger level for implementing these additional measures would be set at 10 percent of the Cal/OSHA permissible exposure limit as feasible based on actual field conditions and sample loading. The laboratory analytical method shall be phase contrast microscopy as verified by transmission electron microscopy by NIOSH 7402.
- The contractor shall be responsible to inform workers when to don respirators based on air quality monitoring data collected by the contractor. In addition, the contractor shall be required to provide the SFPUC's third party consultant with the same air quality monitoring data. The third party consultant will notify the SFPUC immediately when their review of the contractor's data indicates that the contractor employees should don respirators in any given area of the project, and when their review of the contractor's data indicates that the contractor should reinitiate exposure assessment activities.
- The construction contractor shall provide for decontamination (showers, changing areas, disposal of personal protective equipment) for all personnel who have potential for exposure to NOA in excess of 10 percent of the permissible exposure limit prior to leaving the work place in accordance with a Decontamination and Hygiene Facilities Plan reviewed by the City's third party consultant. The plan would specify requirements for decontamination stations, and would also address truck washing, provide for HEPA vacuuming stations, and provide for interim decontamination stations that are easily accessible to personnel to provide worker protective clothing and equipment during work shifts.
- Signs would be posted at the entrances to work areas where activities that disturb NOA would occur and along the road to indicate where NOA-containing materials are known to be present or handled.

5.9.2c Watershed Keeper's Residence

The SFPUC shall require the construction contractor to protect the watershed keeper's residence from NOA and metals-laden dust through the use of barriers or equivalent containment throughout the construction period. The acceptable residual level of asbestos and naturally occurring metals in the residence shall be specified in the Comprehensive Air Monitoring Plan prepared in accordance with Mitigation Measure 5.9.2a, and the SFPUC shall conduct clearance sampling to demonstrate compliance with these standards, and clean the residence to the specified standard if standards are not met upon first sampling.

5.9.2d Excavation Materials Management Plan

To assist in the management and placement of the surplus rock and soil, the SFPUC shall prepare an Excavated Materials Management Plan for the approval of the RWQCB specifying how excavated rock will be properly classified and managed during construction. The contractor shall be required to segregate materials derived from the Franciscan Complex serpentinite and mélange from other materials for separate hauling, stockpiling and final disposition in the on-site disposal areas.

5.9.5 Hazardous Materials in Structures to be Demolished

Any electrical equipment containing polychlorinated biphenyls (PCBs), fluorescent lights containing mercury vapors or fluorescent light ballasts containing PCBs or Bis(2-ethylhexyl)phthalate (DEHP) in any of the structures to be demolished shall be removed and disposed of properly.

5.10 CULTURAL RESOURCES**MITIGATION MEASURES****5.10.1 Archaeological Evaluation and Monitoring, and Treatment of Human Remains**

All archaeological documentation required by this mitigation measure shall be consistent with the format and protocols of the San Francisco Planning Department Major Environmental Analysis Division (MEA) Water System Improvement Program (WSIP) Archaeological Guidance, and shall be reviewed and approved by the MEA Archaeologist or Designee. For those projects that require a federal permit and compliance with the National Historic Preservation Act (NHPA), Section 106, the Environmental Review Officer (ERO) will review the State Historic Preservation Officer (SHPO) approved requirements in the permit conditions and consider protective approaches that limit undue duplication of efforts.

Based on the findings of the project's Historic Context and Archaeological Survey Report (HCASR) or equivalent analysis in an ASR and Historic Resources Inventory and Evaluation Report (HRIER) and the determination of the MEA Archaeologist or Designee, the SFPUC shall retain the services of a qualified archaeologist (i.e., an archaeologist who meets the professional qualifications standards of the Secretary of the Interior) to undertake the archaeological investigations described below.

Archaeological Monitoring Plan

The archaeologist shall prepare an Archaeological Monitoring Plan (AMP) consistent with the protocols of the MEA WSIP Archaeological Guidance. The purpose of the AMP will be to ensure that important, previously unrecorded archaeological resources that are discovered during construction are identified, evaluated, and treated appropriately. The AMP will implement Archaeological Measure 5.10.2, below.

Archaeological Evaluation Plan

The archaeologist shall prepare an Archaeological Evaluation Plan (AEP) consistent with the protocols of the MEA WSIP Archaeological Guidance. The AEP will create a program to determine the potential of the expected resource to meet the CRHR criteria—particularly Criterion 4, the resource's potential to address important research questions identified in the AEP—and the archaeologist shall submit this plan to the ERO for approval. The archaeologist shall then conduct an evaluation consistent with the ERO-approved AEP. The methods and findings of the evaluation shall be presented in an Archaeological Evaluation and Effects Report (AEER), which shall be submitted to the ERO upon completion.

Archaeological Data Recovery and Treatment Plan

Based on the conclusions of the AEER, the MEA Archaeologist or Designee shall determine if the project will adversely affect a California Environmental Quality Act (CEQA)-significant archaeological resource. If the project will have an adverse effect on such a resource, an Archaeological Research Design and Treatment Plan (ARDTP) shall be prepared by the archaeologist and submitted to the ERO. Once approved by the ERO, a data-recovery investigation and/or other treatment, consistent with the ARDTP, shall be conducted by the archaeologist.

Human Remains and Associated or Unassociated Funerary Objects

The treatment of human remains and of associated or unassociated funerary objects discovered during any soil-disturbing activity shall comply with applicable State laws. This shall include immediate notification of the coroner of the county within which the project is located and, in the event of the coroner's determination that the human remains are Native American, notification of the California State Native American Heritage Commission (NAHC), who shall appoint a Most Likely Descendant (MLD) (PRC Section 5097.98). The archaeological consultant, project sponsor, and MLD shall make all reasonable efforts to develop an agreement for the treatment, with appropriate dignity, of human remains and associated or unassociated funerary objects (State CEQA Guidelines Section 15064.5(d)). The agreement should take into consideration the appropriate excavation, removal, recordation, analysis, custodianship, curation, and final disposition of the human remains and associated or unassociated funerary objects. California Public Resources Code allows 24 hours to reach agreement on these matters. If the MLD and the other parties do not agree on the reburial method, the Project will follow Section 5097.98(b) of the California Public Resources Code, which states that “the landowner or his or her authorized representative shall reinter the human remains and items

associated with Native American burials with appropriate dignity on the property in a location not subject to further subsurface disturbance.”

Archaeological Data Recovery Report

The archaeologist shall submit a draft Archaeological Data Recovery Report (ADRR) to the ERO that describes the archaeological and historical research methods employed in the archaeological evaluation/monitoring/data recovery program(s) undertaken, and presents, analyses, and interprets the recovered data. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report. Once approved by the ERO, copies of the ADRR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one copy and the ERO shall receive a copy of the transmittal of the ADRR to the Information Center. MEA shall receive three copies of the ADRR, along with copies of any formal site recordation forms (California Department of Parks and Recreation (CA DPR) 523 series) and/or documentation for evaluation under NRHP/CRHP criteria. In instances of high public interest or high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

5.10.2 Archaeological Measure II: Accidental Discovery Measures

SFPUC Construction Measure #9 for cultural resources requires that construction activities be suspended immediately if there is any indication of an archaeological resource.

To avoid any potentially significant adverse effect from the proposed project on accidentally discovered buried or submerged historical resources as defined in State CEQA Guidelines Section 15064.5(a)(c), the project sponsor shall distribute the Planning Department's archaeological resource “ALERT” sheet to the project prime contractor; to any project subcontractor firms (including demolition, excavation, grading, foundation, pile driving); and/or to utilities firm involved in soil-disturbing activities within the project site. Prior to any soils-disturbing activities being undertaken, each contractor is responsible for ensuring that the “ALERT” sheet is circulated to all field personnel, such as machine operators, field crew, pile drivers, and supervisory personnel. The project sponsor shall provide the ERO with a signed affidavit from the responsible parties (prime contractor, subcontractor(s), and utilities firm) confirming that all field personnel have received copies of the “ALERT” sheet.

If the ERO determines that an archaeological resource may be present within the project site, the project sponsor shall retain the services of a qualified archaeological consultant. The archaeological consultant shall advise the ERO as to whether the discovery is an archaeological resource that retains sufficient integrity and is of potential scientific/historical/cultural significance. If an archaeological resource is present, the archaeological consultant shall identify and evaluate the archaeological resource. The archaeological consultant shall make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require, if warranted, specific additional measures to be implemented by the project sponsor.

Measures might include: preservation in situ of the archaeological resource; an archaeological monitoring program; or an archaeological evaluation program. If an archaeological monitoring program or archaeological testing program is required, it shall be consistent with this measure. The ERO may also require that the project sponsor immediately implement a site security program if the archaeological resource is at risk from vandalism, looting, or other damaging actions.

The project archaeological consultant shall submit an accidental discovery ADRR to the ERO which, in addition to the usual contents of the ADRR, includes an evaluation of the historical significance of any discovered archaeological resource, as well as describing the archaeological and historical research methods employed in the archaeological monitoring/data recovery program(s) undertaken, and presenting, analyzing, and interpreting the recovered data. Information that may put at risk any archaeological resource shall be provided in a separate removable insert within the final report.

Once approved by the ERO, copies of the ADRR shall be distributed as follows: the relevant California Historical Resources Information System Information Center shall receive one copy and the ERO shall receive a copy of the transmittal letter of the ADRR to the Information Center. The MEA shall receive three copies of the ADRR along with copies of any formal site recordation forms (CA DPR 523 series) and/or documentation for nomination to the National Register of Historic Places/California Register of Historical Resources. The SFPUC shall receive copies of the ADRR in the number requested. In instances of high public interest in or the high interpretive value of the resource, the ERO may require a different final report content, format, and distribution than that presented above.

5.10.5 Paleontological Resources

Training

Prior to the initiation of site preparation and/or start of construction, SFPUC shall ensure that all construction forepersons and field supervisors receive training overseen by a qualified professional paleontologist, as defined by the Society of Vertebrate Paleontology's (SVP) Conformable Impact Mitigation Guidelines Committee (1995) and who is experienced in teaching non-specialists, to ensure that they can recognize fossil materials in the event any are discovered during construction. Training on paleontological resources shall also be provided to all other construction workers but may include videotape of the initial training and/or the use of written materials rather than in-person training by a paleontologist.

Conduct Pre-Construction Surveys for Significant Paleontological Resources in Areas of Undetermined and High Paleontological Sensitivity

Prior to construction, the SFPUC will implement the following:

- Contract with a California Registered Geologist (California RG) or a qualified professional paleontologist, as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (1995), to conduct a more detailed evaluation of potential paleontological resources in those areas of the project identified as undetermined or highly sensitive for paleontological resources.

- The evaluation will include a thorough literature-based and field-reconnaissance survey of the potentially sensitive areas where excavation activities are planned. The field survey will be limited to identifying potentially significant features at the surface.
- The evaluation will be documented in a report to be submitted for review and approval by the ERO prior to the start of construction.
- If the evaluation and survey result in the discovery of a paleontological resource exposed at the surface, or confirm the potential for impacts on significant paleontological resources, Mitigation Measures 5.10.5 and 5.10.6 will also be implemented. Mitigation Measure 5.10.3 will be implemented as a safeguard regardless of the identified likelihood of potential impacts.

Perform Pre-Construction Surface Salvage of Any Significant Paleontological Resources Discovered

If a significant paleontological resource is discovered at the ground's surface as a result of preconstruction surveys conducted per Mitigation Measure 5.10.4 and cannot be avoided through exclusion of the area from project disturbance (e.g., through the installation of exclusion fencing), the SFPUC will retain a California RG or a qualified professional paleontologist (as defined in Mitigation Measure 5.10.4) to salvage and treat the resource prior to construction in the immediate vicinity of the find. Salvage of the resource would include recovering the item and properly documenting, preparing, and curating the find. Treatment of the resource may include preparation and recovery of fossil materials for housing in an appropriate museum or university collection, and may also include preparation of a report for publication describing the find. No construction activities at the location of the find will be allowed until the salvage operation is completed and authorization is provided by the SFPUC.

Conduct Paleontological Resources Monitoring during Construction in Areas of Undetermined and High Paleontological Sensitivity, as Required

If determined necessary after implementation of Mitigation Measure 5.10.4, SFPUC will retain a qualified professional paleontologist, as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (SVP 1995), to conduct onsite monitoring for unanticipated discovery of potentially significant paleontological resources during initial ground disturbing activities (e.g., grading and excavation) in the areas with geological units identified as undetermined or highly sensitive for paleontological resources, and as field-verified by the qualified paleontologist. After initial ground disturbance activities in the paleontologically sensitive areas, monitoring will cease but a paleontologist will be retained on-call by the SFPUC and its contractor throughout the project in the event of an unanticipated find during subsequent construction activities.

If potential fossils are discovered during construction, all earthwork or other types of ground-disturbance in the vicinity of the find will stop immediately until a qualified professional paleontologist, as defined by the SVP's Conformable Impact Mitigation Guidelines Committee (SVP 1995), can assess the nature and importance of the find

and recommend appropriate salvage and treatment (as described in Mitigation Measure 5.10.5). The SFPUC will be responsible for ensuring that the recommendations of the paleontological monitor regarding treatment and reporting are implemented and reported to the San Francisco Planning Department.

5.11 VISUAL RESOURCES

MITIGATION MEASURES

None are required.

5.12 TRANSPORTATION AND CIRCULATION

MITIGATION MEASURES

5.12.4a Traffic Control Plan

The SFPUC or its contractor(s) shall prepare and implement a Traffic Control Plan. To the extent applicable, the Traffic Control Plan should conform to the state's Manual of Traffic Controls for Construction and Maintenance Work Areas. As applicable, elements of the Traffic Control Plan should be coordinated with applicable agencies and include, but are not necessarily limited to, the following:

- Advance warning signs shall be installed on Calaveras Road north of Geary Road and on Felter Road and East Calaveras Road south of the dam advising motorists of the construction zone ahead to minimize hazards associated with potential conflict with construction vehicles and to notify motorists of weekday closure of Calaveras Road between Geary Road and Felter Road.
- The SFPUC shall develop a program to notify the potential users (including drivers, bicyclists, and pedestrians) of Calaveras Road between Geary Road and Felter Road of the schedule of roadway closures, detour route for vehicles, and alternate recreational bicycle routes. The SFPUC shall disseminate this information by posting signs along Calaveras Road north and south of the dam, providing up to date details to the East Bay Regional Park District, Alameda County and Santa Clara County, and posting this information on a project website or other easily-accessible media.
- Either flaggers, illuminated signs, a temporary stoplight, a flashing yellow light, or a combination of these methods shall be utilized to slow approaching traffic at project access points on Calaveras Road at Geary Road and at Felter Road.
- Locations shall be identified for parking by construction workers within the established work area.
- Construction shall be coordinated with police and fire, local hospitals, and schools. Operators shall be notified in advance of the timing, location, and duration of construction activities and the location of detours and roadway closures.

- Public roadway rights-of-way shall be repaired or restored to their pre-construction conditions upon completion of construction. The SFPUC shall inspect and document the condition of Calaveras Road prior to and after completion of the project and, if roadway damage is detected, enter into an agreement with Alameda and Santa Clara Counties for implementing a post-construction roadway repair/rehabilitation program. At a minimum, roads damaged by the project shall be repaired to a structural condition equal to that which existed prior to the project construction activities. Maintenance of adequate driving and bicycling conditions of Calaveras Road during the construction period shall also be addressed.
- To the extent applicable, the traffic control plan shall conform to the California Manual on Uniform Traffic Control Devices for Streets and Highway: Part 6 Temporary Traffic Control (Caltrans 2006).

5.12.4b Approval for Road Closures

The SFPUC shall seek approval from Alameda County for closure of Calaveras Road between Geary Road and the dam site, to through traffic, Monday to Friday, except for emergency vehicles, during 2 periods when hauling on Calaveras Road from Geary Road to the dam site would create substantial conflicts with other vehicles. These two periods are estimated to occur for 2 months in summer 2011 and 18 months beginning in winter 2012. The SFPUC shall also seek approval from Santa Clara County for either (1) closure of the Calaveras Road between the dam site and Felter Road, to through traffic, Monday to Friday, except emergency vehicles, to avoid creating a 7-mile long dead-end with no outlet, or (2) constructing a turnaround at the dam site and installing signage at Felter Road advising of no outlet 7-miles up the road due to construction for the same 2 periods.

5.13 AIR QUALITY

MITIGATION MEASURES

5.13.1a Fugitive dust mitigation measures recommended by the Bay Area Air Quality Management District

The SFPUC shall implement the following BAAQMD-recommended mitigation measures to reduce emissions of fugitive dust (particulate matter, or PM₁₀) from construction activities:

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose materials *or* require all trucks to maintain at least 2 feet of freeboard.
- Pave, apply water three times daily, *or* apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at the construction site.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.

- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily, *or* apply (nontoxic) soil binders to exposed stockpiles (dirt, sand).
- Limit traffic speeds on unpaved roads to 15 miles per hour or as allowed by the BAAQMD based on site conditions.
- Replant vegetation in disturbed areas as quickly as possible.

5.13.1b BAAQMD-recommended exhaust emissions mitigation measures

The SFPUC shall implement the following BAAQMD-recommended mitigation measures to reduce exhaust emissions of reactive organic gases, nitrogen oxides, and PM₁₀ from construction activities:

- Use grid power instead of diesel generators at all construction sites where it is feasible to connect to grid power.
- In contract specifications, include California Code of Regulations, Title 13, Sections 2480 and 2485, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds) to 5 minutes at any location. This requirement shall also apply to barges in the event that Haul Option 2 is selected. In addition, limit the use of diesel auxiliary power systems and main engines to 5 minutes when within 100 feet of homes while the driver is resting; this would not apply to the SFPUC watershed keeper's residence, which would be vacated.
- Minimize idling time to a maximum of 5 minutes for all of all non-commuting diesel vehicles and equipment.
- Locate staging areas and equipment maintenance activities as far from sensitive receptors as possible.
- Develop a schedule of low-emissions tune-ups and perform such tune-ups on all equipment. A log of required tune-ups shall be maintained and a copy of the log submitted to the SFPUC on a monthly basis for review. In addition, all equipment shall be maintained in good working order and properly tuned in accordance with manufacturers' specifications.

5.13.3a Diesel Particulate Matter Reduction - Off-road Equipment

The SFPUC shall ensure that construction-contract specifications include a requirement that all off-road diesel construction equipment is equipped with U.S. Environmental Protection Agency Tier 2 diesel engines as defined in U.S. Code of Federal Regulations, Title 40, Part 89 and are equipped with California Air Resources Board Level 3 Diesel Emission Control Strategies as defined in Title 13, California Code of Regulations, §§2700 through 2710. The construction-contract

specifications will require the contractor to submit a comprehensive inventory of all off-road construction equipment that will be used during any portion of the construction project. The inventory shall include each piece of equipment's license plate number, horsepower rating, engine production year, confirmation that the equipment contains a Level 3 abatement device verified by the California Air Resources Board, and projected hours of use or fuel throughput for each piece of equipment. The contractor shall update the inventory and submit it monthly to the SFPUC throughout the duration of the project.

5.13.3b Diesel Particulate Matter Reduction – On-site Haul Trucks and Idling Limits

The SFPUC shall ensure that diesel-fueled haul trucks restricted to on-site routes are model year 2004 or newer.

5.14 NOISE AND VIBRATION

MITIGATION MEASURES

5.14.1 Noise Controls

The SFPUC shall incorporate into contract specifications a requirement that construction noise shall not exceed the following ordinance daytime and nighttime noise limits to the extent feasible: 63 and 53 A-weighted decibels (dBA), respectively (energy equivalent noise level [L_{eq}]; Table B11-152 of Section B11-152 of the Santa Clara County Code) for mobile equipment, and 60 dBA and 50 dBA (L_{eq}), respectively, as required in Section B11-154(6)(a) of the Santa Clara County Code, for stationary equipment at receptors located in Santa Clara County; 58 and 53 dBA, respectively (L_{eq} ; Table 6.60.040A in Section 6.60.040 of the Alameda County General Code) for all equipment at receptors located in Alameda County.

In addition, daytime construction noise levels shall not exceed the 70-dBA speech interference criterion and nighttime construction noise levels will not exceed the 50-dBA sleep interference criterion at sensitive receptors. Since most receptors are located 3,000 feet or more from project construction areas, noise attenuation rates over such long distances can vary depending on atmospheric absorption and topographic characteristics. Since project-related construction noise level estimates presented in Tables 4.14.5 and 4.14.6, in Section 4.14, Noise and Vibration, only exceed the 50-dBA sleep interference criterion by 1 dBA, it is possible that no noise control measures will be needed to meet these criteria or ordinance noise limits at the closest sensitive receptors. However, if noise levels are found to exceed these criteria or noise ordinance limits, measures that could be implemented to reduce noise levels include the following:

Noise generated by nighttime operations (10 p.m. to 7 a.m.) in the outer margins of Borrow Area E and at Staging Area 11 shall be limited as necessary to ensure that this facility can meet the nighttime noise ordinance limit (Santa Clara County Code limits mobile equipment to 53 dBA and stationary equipment to 50 dBA) and not exceed the 50-dBA sleep interference criterion at Receptor B and any other more distant residential receptors. To meet these criteria at this receptor or if certain types of peak noise events occur and become disturbing (e.g., banging or hammering at the

repair facility or use of backup beepers), it may become necessary to enclose equipment repair facilities or restrict noise-generating activities during the night to ensure that all nighttime operations associated with the borrow and staging areas minimize the potential for sleep disturbance at this receptor.

Implement feasible noise controls on all equipment operating in Borrow Area E and Staging Area 11, such as the following:

- Use best available noise control techniques (including mufflers, intake silencers, ducts, engine enclosures, and acoustically attenuating shields or shrouds) for all equipment and trucks in order to minimize construction noise impacts.
- Locate stationary noise sources as far from sensitive receptors as feasible when space is available and there is no conflict with worker safety. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate when space is available and there is no conflict with worker safety) will be used to meet local noise ordinance limits to the extent feasible. Enclosure opening or venting should face away from sensitive receptors. If any stationary equipment (e.g., generators) is operated beyond the time limits specified by the pertinent noise ordinance, this equipment should conform to the affected jurisdiction's pertinent day and night noise limits at the receptor sites.
- Locate material stockpiles as well as maintenance/equipment staging and parking areas as far from the closest residential receptors as possible. Alternatively, enclose any equipment repair facilities as necessary to ensure that the closest residents are not disturbed by nighttime noise.
- Prohibit haul and delivery trucks from operating within 200 feet of any residential uses during the nighttime hours (10 p.m. to 7 a.m.) if noise levels exceed the nighttime thresholds. If sensitive receptors are beyond 200 feet from the haul route, then limited truck operations shall be allowed between 10 p.m. to 7 a.m.; however, noise generated by these operations cannot exceed the 50-dBA sleep interference criterion at the closest receptors.
- Designate a project liaison to be responsible for responding to noise complaints during the construction phases. The name and phone number of the liaison will be conspicuously posted at construction areas and on all advanced notifications. This person will take steps to resolve complaints, including periodic noise monitoring, if necessary. Results of noise monitoring will be presented at regular project meetings with the project contractor, and the liaison will coordinate with the contractor to modify any construction activities that generated excessive noise levels.
- Require a reporting program that documents complaints received, actions taken to resolve problems, and effectiveness of these actions.
- If impact equipment (e.g., jack hammers, pavement breakers, and rock drills) is used during project construction, use hydraulically or electric-powered equipment wherever feasible to safely conduct the required activity to avoid the noise associated with compressed-air exhaust from pneumatically powered tools.

However, where use of pneumatically powered tools is unavoidable, an exhaust muffler on the compressed-air exhaust will be used if required to reduce noise levels to within acceptable thresholds (a muffler can lower noise levels from the exhaust by up to about 10 dBA). External jackets on the tools themselves will be used, if required to reduce noise levels to within acceptable thresholds, which could achieve a reduction of 5 dBA. Quieter procedures, such as drilling rather than impact equipment, will be used whenever feasible to safely conduct the required activity.

- If pile driving is used for construction of the jetty in the southern portion of the reservoir, use sonic or vibratory pile drivers instead of impact pile drivers wherever feasible depending on site or soil conditions (sonic pile drivers are only effective in some soils).
- Prohibit pile driving activities during the evening and nighttime hours (7 p.m. to 7 a.m.).

5.14.3 Blasting Noise Control

If peak noise events associated with controlled blasting are found to exceed the Alameda County Noise Ordinance maximum noise limit of 70 dBA ($L_{\max}$) at any Alameda County residential receptors or 75 dBA ($L_{\max}$) at any Santa Clara County residential receptors, blasting charges shall be modified to be consistent with these noise limits, which would require blasting charges to be reduced so that noise levels do not exceed 112 dBA ($L_{\max}$) at 50 feet or 106 dBA ($L_{\max}$) at 100 feet. Alternatively, if blasting charges cannot be reduced sufficiently, then frequency of blasting (number of blast events during any given day or hour) shall be reduced to meet ordinance noise limits.

5.15 UTILITIES, SERVICE SYSTEMS, AND PUBLIC SERVICES

MITIGATION MEASURES

None are required.

5.16 MINERAL AND ENERGY RESOURCES

MITIGATION MEASURES

None are required.

5.17 CUMULATIVE IMPACTS

MITIGATION MEASURES

5.17.1 Restrict Truck Operations at Night

The SFPUC shall restrict total truck volumes from all WSIP projects on Calaveras Road near the watershed keeper's residence (located approximately 225 feet east of the road) to 60 vehicles and 30 trucks per hour during nighttime hours or another vehicle mix that will achieve the 50-dBA sleep interference threshold. Truck traffic shall be coordinated through the SFPUC WSIP construction coordinator designated in Mitigation Measure 6.1.

(PEIR) analyzed the growth inducement potential of the WSIP water supply strategy. Because the WSIP includes the proposed project, it is a contributing factor to the WSIP water supply strategy growth potential. CEQA requires that an environmental impact report (EIR) evaluate the growth-inducing impacts of a proposed project.¹ A growth-inducing impact is defined as follows:

[T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth.... It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

The PEIR on the SFPUC's WSIP concluded that the WSIP as a whole would support planned growth in the existing SFPUC service area. As explained in Chapter 3, Project Description, the proposed project is a component of the WSIP and thus contributes to its indirect growth inducement effect. By removing the lack of a reliable water supply and supply system as one potential obstacle to growth within the SFPUC service area, the WSIP, and thus the proposed project, would have an indirect growth-inducing effect according to the CEQA definition above.²

This EIR tiers from the WSIP PEIR, and the growth inducement analysis contained in PEIR Chapter 7 and associated Appendix E are applicable to the proposed project. All impacts related to the WSIP water supply strategy to which this project contributes have been examined in detail in the PEIR and no new, relevant information is available to augment that analysis with the exception of the re-evaluation of water supply and system operations impacts on the Alameda Creek watershed related to the Calaveras Dam Replacement Project (CDRP) as explained earlier in this EIR (see Chapter 2, Introduction and Background). The significant environmental effects related to growth to which this project would contribute were analyzed at a sufficient level of detail in the PEIR, the conclusions reached are unchanged by the updated analysis of water supply effects on the Alameda Creek watershed, and there is no new, relevant information available to augment the growth analysis in the PEIR. A summary of the growth inducement analysis in the PEIR is provided below.

Implementation of the WSIP would meet customer purchase requests through the year 2018, as discussed in the PEIR. Meeting additional purchase requests would provide water to serve additional residential and business customers in the existing SFPUC service area. The SFPUC service area spans seven counties—Tuolumne, Stanislaus, San Joaquin, Alameda, Santa Clara, San Mateo, and San Francisco. The Association of Bay Area Governments (ABAG) is the agency responsible for providing regional growth projections for the San Francisco Bay Area,

¹ CEQA Guidelines Section 15126.2(d).

² The WSIP would not *directly* induce growth as it does not involve the development of new housing to attract additional population, nor would it indirectly induce growth by establishing substantial permanent or even short-term construction employment opportunities that could stimulate population growth. Construction of the WSIP projects is not expected to involve employment opportunities substantially beyond what would normally be available to construction workers in the area, and workers are expected to be drawn from the local labor pool.

which covers the majority of the SFPUC service area. ABAG growth projections, along with other published sources (such as Bay Area Water Supply and Conservation profiles), are discussed below because of their relevance to the SFPUC service area.

A variety of factors influence new development or population growth in the area served by SFPUC water, including economic conditions of the region, adopted growth management policies in the affected communities, and the availability of adequate infrastructure (e.g., water service, sewer service, public schools, and roadways). Economic factors are generally the lead driver. While water service is only one of many factors affecting the growth potential of a community, it is one of the chief public services needed to support urban development, and lack of a reliable water supply as well as a service capacity deficiency could constrain future development.

Pursuant to CEQA, growth *per se* is not assumed to be necessarily beneficial, detrimental, or of little significance to the environment; it is the secondary, or indirect, effects of growth that can cause adverse changes to the physical environment. The indirect effects of population and/or economic growth and accompanying development can include increased demand on community services and public service infrastructure, increased traffic and noise, degradation of air and water quality, and conversion of agricultural land and open space to urban uses. Local land use plans (e.g., general plans and specific plans) of the jurisdictions served by the SFPUC establish land use development patterns and growth policies that are intended to allow for the orderly expansion of urban development supported by adequate public services, including water supply, roadway infrastructure, sewer service, and solid waste service. Local jurisdictions conduct CEQA environmental review on their general and specific plans to assess the secondary effects of their planned growth. A project that would induce growth that is inconsistent with local land use plans and policies could indirectly cause adverse environmental impacts, as well as impacts on public services, that the local land use jurisdictions have not previously addressed in the CEQA review of their land use plans and development proposals. By removing the lack of a reliable water supply and water system (as one potential obstacle to growth within the SFPUC service area) and providing and assisting in development of additional water supply sources, such as recycled water and groundwater projects as well as promotion of more efficient use of water through conservation measures, the WSIP would have an indirect growth-inducing effect according to the CEQA definition above. The WSIP would support growth in the SFPUC service area through 2018, although it appears that some growth would occur irrespective of the WSIP due to increased water delivery efficiencies (e.g., plumbing code changes), conservation, and other water supply sources. Growth would in turn result in indirect effects. In most cases, the effects of population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated.

Potentially significant and unavoidable impacts as a result of growth in the SFPUC service area could include the following: traffic congestion, air pollution, traffic noise, construction noise, increased demand for public schools and other public services, loss of recreational opportunities and impacts on visual quality resulting from the loss of open space, cumulative effects on over-utilized parks, loss of wildlife habitat and wetlands and impacts on other biological resources, cumulative impacts on cultural resources, increased flooding potential, increased urban runoff pollutants, seismic hazards, induced population growth, failure to meet housing demand for projected population growth, exposure of new development to contaminated soil or groundwater, insufficient water supply, insufficient wastewater disposal capacity, loss of agricultural resources, land use conflicts, conflicts with existing land use plans or policies, and changes in density, scale, and character of an area.

The adopted WSIP would have growth-inducement potential through 2018 because the SFPUC (with the cooperation of the wholesale customers) would provide the additional water supply to meet purchase requests through 2018. The WSIP would support much of the growth through 2018 in the jurisdictions served by the SFPUC regional water system. In general, development that was planned and approved through the general plan process in the SFPUC service area would have environmental impacts. The environmental consequences of this planned growth have been largely addressed in local plans and the associated CEQA review as well as in other, project-specific documentation.

No mitigation measures were proposed for implementation by the SFPUC that could substantially decrease or eliminate growth-inducing impacts because the SFPUC does not have control over the decisions that each local agency will make with respect to growth in their jurisdictions. Individual agencies' general plans and environmental documents contain actions, limitations, and mitigation measures that will be implemented in the individual jurisdictions with local development project or program approvals. These types of mitigation measures were identified in the WSIP PEIR (see PEIR Chapter 7 and PEIR Appendix E).

To assess the growth inducement potential of the WSIP as originally proposed, which included a planning period through 2030, and to characterize the secondary effects of growth, the PEIR investigated the following questions:

- What assumptions did the SFPUC and its wholesale customers make regarding growth (population and employment) in projecting future (2030) total water demand and customer purchases from the SFPUC?
- Are these assumptions consistent with forecasts prepared and used by local and regional planning agencies (e.g., ABAG, counties, and cities) within the service area? What are the growth trends in the Bay Area region?
- Are there any notable inconsistencies between the population and employment forecasts used by the SFPUC and the wholesale customers and those of the local and regional

planning agencies that suggest that the water supply planning efforts are inconsistent with land use planning efforts?

- Is the level of growth projected for 2030 consistent with that identified and planned for in existing adopted general plans?
- What are the potential environmental impacts (secondary effects) associated with growth projected to occur in the service area? Have these impacts been evaluated in previous CEQA review documents on existing general and specific plans?
- What mitigation measures and findings have the local jurisdictions adopted as part of approving their future growth plans?

The issues raised in these questions are summarized below and addressed in detail in PEIR Chapter 7 and supplemented by PEIR Appendix E.

- *SFPUC Projections (PEIR Section 7.2)*. Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth. The SFPUC and its customers used computer models to forecast future water demand. Section 7.2 presents an overview of the SFPUC water service area, and describes key factors (assumptions, inputs, and methodologies) used in estimating future demand that relate to growth and inform comparisons between water demand and land use planning projections. These factors include baseline population, methodology used to determine existing water usage by land use/account type, the current water supply agreement between the SFPUC and its wholesale customers, and assumptions regarding future land use patterns, water conservation and recycling, and water from other (non-SFPUC) sources through 2030. The demand estimates, in conjunction with estimates of savings from conservation and use of other water sources, provide the basis for the 2030 purchase estimates.
- *Growth Inducement Potential (PEIR Section 7.3)*. This section analyzes the WSIP's growth inducement potential: whether the demand to be met by the WSIP would be consistent with local plans and policies or could contribute to growth in the service area beyond that called for in the existing general plan. To gauge the consistency of the WSIP with growth planned in the jurisdictions served by the SFPUC, the analysis compares the growth assumed in the SFPUC projections to growth forecasts developed by ABAG and reflected in adopted land use plans in the service area. With respect to ABAG, this section also describes ABAG's changing expectations about growth as reflected in its updated projections issued in 2002, 2003 and 2005.
- *Indirect Effects of Growth (PEIR Section 7.4)*. Growth, whether planned or unplanned, can cause environmental impacts. Section 7.4 describes the potential impacts of growth that could be supported, in part, by implementation of the WSIP. This section also identifies measures adopted to reduce, eliminate, or otherwise mitigate the impacts of planned growth.

6.1.2 SUMMARY OF CONCLUSIONS

A review of historical growth trends of a selection of jurisdictions in the service area, based primarily on information in general plans and Bay Area Water Supply and Conservation Association profiles, shows that:

- Cities in the service area are largely urbanized, and most experienced rapid growth in the postwar decades through the 1970s.
- Milpitas and East Palo Alto experienced high rates of growth more recently.
- San Francisco's population has fluctuated somewhat but on average it has been essentially stable over the past 50 years.
- Many jurisdictions cannot grow laterally and their general plans include policies to manage growth. Many general plans identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, as means to accommodate future growth.
- The SFPUC's wholesale customers vary widely, in a variety of ways: by size, overall demand projected for 2030, the change that the 2030 demand represents in absolute terms and as a percentage of 2001 demand, and the degree to which the customers depend on the SFPUC for their water supply. As such, the WSIP would remove growth obstacles to varying degrees within the service area.

6.1.2.1 Indirect Effects of Growth

The indirect effects of growth expected in the general plans of jurisdictions in the service area have been identified in the EIRs prepared for those plans. PEIR Section 7.4 presents a table of impacts commonly identified as significant and unavoidable, as well as those commonly identified as significant but mitigable.

- The most commonly identified significant and unavoidable impacts of growth are:
 - Increased traffic congestion;
 - Deterioration of air quality; and
 - Cumulative effects of increased air pollutant emissions and noise.
- Mitigation measures were adopted by local jurisdictions as part of their general plan approval processes to address the secondary effects of planned growth. These measures are summarized in PEIR Chapter 7.
- Two cities identified increased demand for potable water supply as a significant and unavoidable effect of growth; the WSIP would address this issue in those two cities.
- Overriding considerations commonly adopted by the decision-making bodies in adopting their general plans include the following:
 - Accommodation of growth in an orderly, fiscally sound manner;
 - Economic diversification and job generation;
 - Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing;
 - Improvements in the local jobs/housing balance;
 - Increased sales revenue and positive fiscal impact;
 - Promotion of alternative modes of travel to reduce reliance on private vehicles; and
 - Establishment of policies to preserve natural areas and open space lands.

- For many cities that receive water from the SFPUC regional system, the supply to be provided under the WSIP supports and is consistent with the planned growth reflected in their existing adopted general plans. For other communities, it appears that the WSIP supply (in combination with other supply sources available to those communities) could serve a level of growth beyond that identified in the existing general plans. In those cases, secondary effects of such growth could include impacts related to increased density and impacts related to development of new land areas.
 - Density-related impacts could include increased traffic congestion, air pollution, traffic noise, construction noise, and demand on public services.
 - Land area-related impacts could include loss of open space and agricultural land, and loss of and degradation of water quality due to increases in impervious surface area.

6.2 CUMULATIVE IMPACTS

This section presents the cumulative impacts analysis for the CDRP EIR. The discussion first sets out the CEQA framework for the analysis. It then addresses the factors that determined which projects to consider in the cumulative impacts evaluation and lists the projects included in the analysis. The third part of the discussion presents the cumulative impacts by environmental topic.

Cumulative impacts, as defined in Section 15355 of the CEQA Guidelines, refer to two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts. The cumulative impact from several projects is the change in the environment that results from the incremental impact of the proposed project when added to other closely related past, present, or reasonably foreseeable future projects. Pertinent guidance for cumulative impact analysis is provided in Section 15130 of the CEQA Guidelines:

- An EIR shall discuss cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (i.e., the incremental effects of the proposed project are significant when viewed in connection with the effects of past, current, and probable future projects). (CEQA Guidelines Sections 15130(a) and 15065(a)(3))
- An EIR should not discuss cumulative impacts that do not result in part from the project evaluated in the EIR.
- A project's contribution is not significant if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.
- The discussion of impact severity and likelihood of occurrence need not be as detailed as for effects attributable to the project alone.
- The focus of analysis should be on the cumulative impact to which the identified other projects contribute, rather than on attributes of the other projects that do not contribute to the cumulative impact.

6.2.1 APPROACH

Two approaches to a cumulative impact analysis are discussed in the CEQA Guidelines Section 15130(b)(1): (a) the analysis can be based on a list of past, present, and probable future projects producing related or cumulative impacts; or (b) a summary of projections contained in a general plan or related planning document can be used to determine cumulative impacts. The analysis presented in this EIR employs the list-based approach. The following factors were used to determine an appropriate list of projects to be considered in this cumulative analysis:

- *Similar Environmental Impacts* – a relevant project contributes effects on resources also affected by the proposed project.
- *Geographic Scope and Location* – a relevant project is located within a defined geographic scope for the cumulative effect.
- *Timing and Duration of Implementation* – effects associated with activities for a relevant project (e.g., short-term construction or demolition, or longer operations) would likely coincide in timing with the effects of the proposed project.

6.2.1.1 Similar Environmental Impacts

As described in Chapter 4, Environmental Setting and Impacts, the proposed project would have potential environmental impacts characterized as “significant and unavoidable,” “less than significant with mitigation,” or “less than significant.” Even impacts that were found to be less than significant at the project level are considered in the cumulative impact analysis because it is possible that the residual impact (the impact that was found to be “less than significant” but greater than “no impact”) could contribute to a significant cumulative impact.

Relevant projects in this cumulative analysis include those that could contribute incremental effects to the same environmental resources.

6.2.1.2 Geographic Scope and Location

The potential for project-generated impacts to contribute to a significant cumulative impact arises if projects are located within the same geographic area. Generally, the geographic scope of potential cumulative impacts encompasses the project site, the main travel route to and from the project site, and the immediate vicinity in the portion of the Sunol Valley that surrounds the project site. This geographic area may vary, depending upon the environmental resource being discussed and the geographic extent of the potential impact. For example, the geographic areas associated with visual impacts would include portions of Calaveras Road near Calaveras Reservoir and hiking trails with views of Calaveras Dam in nearby recreational areas, whereas the geographic areas affected by truck traffic would be along much of Calaveras Road and Interstate 680 (I-680). Nearby construction projects might also affect Calaveras Road or I-680, but might not affect views from hiking trails. Therefore, the geographic scope of potential cumulative impacts is defined for each issue area.

6.2.1.3 Timing and Duration of Implementation

Cumulative construction impacts would occur only during the time that the proposed project is under construction and most would be considered short-term impacts. The CDRP is expected to be under construction from 2011 until 2014, a period of about 4 years. Other similar projects taking place in the same general area but scheduled to begin construction in 2015 or later would not be expected to result in construction impacts that would combine with those of the proposed project; therefore, those projects are not included among those considered in this analysis. To be conservative, and because the schedules for future projects listed in Table 6.1 (described below) are broadly estimated and could be substantially different from the dates shown, projects that may be under construction in 2015 have been included even though their impacts may not combine with those of the CDRP. Similarly, schedules for many projects are shown as “TBD,” meaning that the schedule is either unknown or has not yet been determined. These projects are also assumed to be under construction during some portion of the construction schedule for the CDRP.

Long-term impacts are those that would persist after construction of the proposed replacement dam has been completed, the reservoir has been refilled, and the equipment is operating. To contribute to potential longer term, permanent, or operational effects, other activities must be reasonably foreseeable, probable future projects that have long-term effects.

6.2.2 LIST OF RELEVANT PROJECTS

Table 6.1 lists the past, present, and reasonably foreseeable projects and activities within the Sunol Valley region, where the CDRP is located. It provides a brief description of each project, the planning jurisdiction in which the project is located, and its estimated schedule. The table also identifies the potential areas of cumulative effects (or the reasons that no cumulative effects are expected). The cumulative impacts identified for the listed projects relate mainly to construction activities, because the impacts of the CDRP would primarily occur during construction. Figure 6.1 shows the general locations of these projects in relation to the CDRP. (The location numbers in the figure correspond to the project numbers in the table.)

The list of projects shown in Table 6.1 was developed by contacting Alameda County and Caltrans, reviewing the City of Fremont Development Activity Database, and reviewing recent environmental documents for nearby projects. These documents include the *Alameda Siphons Seismic Reliability Upgrade Project Initial Study/Mitigated Negative Declaration* (Alameda Siphon No. 4 Project) (San Francisco Planning Department 2008), the *New Irvington Tunnel Draft EIR* (San Francisco Planning Department 2009a), the *Sunol Valley Water Treatment Plant Expansion and Treated Water Reservoir Draft EIR* (San Francisco Planning Department 2009b), the *Sunol-Niles Dam Removal EIR* (San Francisco Planning Department 2005), and the *Alameda County Composting Facility on Andrade Road EIR* (ACWMA 2004), although this project was officially withdrawn in June 2006 under an Alameda County Waste Management Authority

(ACWMA) board resolution. The selection process for preparation of the list of projects also considered past, present, and foreseeable non-SFPUC and SFPUC projects in the area, including those undergoing programmatic review in the WSIP PEIR as well as other SFPUC projects that have or are undergoing project-specific review in advance of the PEIR. In general, the list presented in Table 6.1 includes projects under development and planned in the future and does not specifically identify SFPUC or other projects that have been completed (e.g., existing Irvington Tunnel, existing Alameda Siphons, and the existing water treatment facilities). However, the existing environmental conditions reflect the cumulative effects of these past projects, and these conditions form the basis for assessing the effects of probable future projects and cumulative impacts.

6.2.3 CUMULATIVE EFFECTS BY ENVIRONMENTAL TOPIC

The following discussion reviews the environmental resource areas of potential impact of the proposed project identified in this Draft EIR and evaluates the potential for cumulative effects with any of the other projects and activities listed in Table 6.1. Where there is a potential for cumulative effects, an assessment is provided addressing whether the project's incremental contribution to the effect would be cumulatively considerable. If appropriate, mitigation measures are identified to address cumulative effects.

6.2.3.1 Land Use, Agricultural Resources, and Recreation

The geographic scope of cumulative impacts on land use, agricultural resources, and recreational resources is the Alameda Creek watershed, the Sunol Valley, and the regional and state recreation areas that surround the Calaveras Reservoir.

In the area of agricultural resources, the CDRP would temporarily remove small portions of the 32,000 acres that are leased from the SFPUC and used for grazing. However, grazing would return once the replacement dam is constructed. Some cumulative projects have the potential to contribute to a cumulative impact on agricultural resources. Implementation of the Sunol Valley Water Treatment Plant (SVWTP) Expansion by the SFPUC would convert land mapped as Prime and Unique Farmland to non-agricultural use. It is possible that expansion of quarries in the Sunol Valley would result in the loss of grazing land or areas mapped as Unique Farmland. The CDRP, however, would not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Significance to non-agricultural uses or conflict with any Williamson Act contracts. Therefore, the CDRP would not make a substantial contribution to any region-wide cumulative losses of agricultural land in the Bay Area. The CDRP's contribution to cumulative impacts on agricultural resources would be less than significant.

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
1	Proposed SFPUC New Irvington Tunnel This project would construct a new tunnel parallel to and just south of the existing Irvington Tunnel to convey water from the Hetch Hetchy system and the Sunol Valley WTP to the Bay Area. The new tunnel would be a redundant water transmission facility to the existing Irvington Tunnel. The preferred project would include construction of: • New 18,200-foot-long, 10-foot-diameter tunnel; • New portal at the east end adjacent to the existing Alameda West Portal in the Sunol Valley with connections to the existing and proposed Alameda Siphons; and • New portal at the west end adjacent to the existing Irvington Portal in Fremont with connections to the existing and proposed Bay Divisions pipelines.	Aesthetic effects associated with construction, including lighting Terrestrial habitat effects Management of excavated spoils and associated aesthetics and potential effects on hydrology Historic resources Construction erosion and water quality Noise and vibration from construction and backfill compaction activities Construction-period traffic Construction-period air quality	2010-2013
2	Proposed SFPUC Sunol Valley Water Treatment Plant (SVWTP) Expansion and Treated Reservoir Project (SVWTP Project) (Includes new treated water reservoirs, 40-million-gallon-per-day (mgd) treated water supply capacity, and new 78-inch discharge pipeline.) This project would provide for the planning, design, and construction of new treated water storage reservoirs and additional 40 mgd of treatment capacity at the SVWTP to comply with requirements of the California Department of Health Services. The project would include construction of: • A 0.5-mile, 78-inch-diameter discharge pipe to connect to the Regional Transmission System; • A new 17.5-million-gallon treated water reservoir; • A new 3-million-gallon chlorine contact tank; • A new chemical (ammonia and chlorine) storage and feed system; • New flocculation, sedimentation, and filtration basins; • New filtered water and backwash basin and piping; • A new 600-kilowatt diesel generator and two new 5,000-gallon diesel fuel storage tanks; • Miscellaneous piping, valves, and mechanical, and electrical work; and • Spoils hauling and placement.	Terrestrial habitat effects Construction-related air quality impacts Construction-period traffic Management of excavated spoils and related aesthetic effects Hydrology and water quality effects on tributaries to Alameda Creek	2010-2013

continued

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
3	Proposed SFPUC Alameda Siphons Seismic Reliability Upgrade Project (Alameda Siphon No. 4 Project) Proposed project components include construction of a fourth siphon and connections to the Coast Range Tunnel and existing siphons; reinforcement of an existing siphon; seismic upgrades at, and in the vicinity of, the Alameda East Portal; improvements to existing and construction of new access roads; and retrofitting of the existing bridges over Alameda Creek; relocation and extension of the overflow pipeline from the Alameda East Portal for water discharge from the Coast Range Tunnel; and various ancillary project elements, including new control buildings, minor water-treatment facilities, and replacement of existing pipeline connections to the Coral Hollow and General Electric pipelines that provide service to the Town of Sunol and General Electric facilities. Construction-related activities would include excavation, grading, equipment installation, clean-up and restoration, and equipment staging. Alameda Siphon No. 4 would be installed under Alameda Creek by micro-tunneling. The proposed project would generate an estimated 81,000 cubic yards of excess spoils, which would be disposed in an adjacent quarry or trucked out of Sunol Valley for reuse and/or disposal.	Aesthetic effects associated with construction, including lighting Terrestrial habitat effects Management of excavated spoils and associated aesthetics and potential effects on hydrology Historic resources Construction erosion and water quality Noise and vibration from construction and backfill compaction activities Construction-period traffic Construction-period air quality	2009–2011
4	Proposed SFPUC San Antonio Backup Pipeline Project (SABPL Project) This project would consist of three proposed facilities: (1) San Antonio Backup Pipeline, a new pipeline (size undetermined) from San Antonio Reservoir to San Antonio Pump Station, about 2 miles long; (2) San Antonio Creek Discharge Facilities (improvements allowing for the discharge of Hetch Hetchy water and associated road improvements); and (3) a chemical building (82 feet long by 42 feet wide by 24 feet high) located north of the existing Alameda Siphons west of Calaveras Road.	Construction erosion and water quality Terrestrial habitat effects Noise and vibration from construction Construction-period traffic Construction-period air quality Historic resources Visual aesthetics	2011–2013

continued

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
5	Proposed SFPUC Various Pipeline Inspection Projects SFPUC pipeline inspections consist of an internal evaluation of the pipe network. Pipelines are accessed via existing access ports. It is necessary to dewater the pipe before the inspection and later disinfect the pipe before refilling it. The pipes are typically dewatered through existing blow-off valves and refilled with water via existing air valves. Discharge permits are obtained from the Water Board and local agencies prior to work and the work would be subject to inspection and compliance with appropriate Best Management Practices (BMPs). In rare cases, a minor amount of excavation may be necessary to gain access to the pipeline. (Various locations; not shown on Figure 6.1.)	Minor increase in traffic on Calaveras Road and Interstate 680 (I-680)	Ongoing activity
6	Proposed SFPUC San Antonio Reservoir Hypolimnetic Oxygenation System Project (SARHOS Project) This project is designed to reduce excessive buildup of nutrients in the deepest layer of water in San Antonio Reservoir, thereby inhibiting future algal blooms; reduce the formation of iron, manganese, and hydrogen sulfide that result from a lack of oxygen in the reservoir; and maintain necessary oxygen concentration in the deepest layers of the reservoir to increase the usable habitat for cold water fish. Project components include concrete pads for facilities, parking, and access roads; tanks; vaporizers; valves; piping and other associated structures; underground electrical supply line; and oxygen lines and diffusers suspended at specified depths within the reservoir.	Impacts on sensitive habitats and species Construction-period traffic Construction-period air quality	Proposed construction to begin summer 2009 or summer 2010.
7	Proposed SFPUC San Antonio Pump Station (SAPS) Upgrade This project would replace three corroded electrical pumps, install two 1.5-megawatt standby electrical generators and associated fuel system to back up three existing 1,000-HP electrical pumps, and seismically retrofit the existing SAPS building by extending the foundation and shotcreting the building exterior. Two temporary staging areas would be located adjacent to the SAPS and Chloramination Building. No grading or excavation is necessary to accommodate the proposed staging areas.	Construction-period traffic Air quality Noise Wildfire hazards	2009-2010

continued

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
8	Proposed SFPUC Upper Alameda Creek Filter Gallery Project This project would recover water released from the Calaveras Dam or bypassed at the Alameda Creek Diversion Dam (ACDD) under the requirements of the Memorandum of Understanding (MOU) between the SFPUC and California Department of Fish and Game. The SFPUC would recover the water downstream via an infiltration gallery (perforated pipes) to be constructed directly beneath the streambed of Alameda Creek just upstream of the confluence of Alameda and San Antonio Creeks. The primary project components include the infiltration gallery (pipes beneath Alameda Creek), a new pipe from the infiltration gallery connecting to the existing Sunol Pipeline, and a sump and small pump station at the end of the infiltration gallery which would allow the SFPUC to pump the recovered water through the Sunol Pipeline to the San Antonio Pipeline where water would then be transported to the San Antonio Reservoir. The infiltration gallery and new pipe would be installed via open-cut construction method.	Impacts on sensitive species and habitats Hydrology Water quality	2014-2015
9	Proposed SFPUC Water System Improvement Program (WSIP) Habitat Reserve Program This project would develop and enhance wetlands and other habitats to be applied toward mitigation of impacts on biological resources resulting from implementation of the WSIP. (Various locations; not shown on Figure 6.1.)	Terrestrial habitat effects Impacts on fisheries Water quality Agricultural resources	TBD
10	Alameda County I-680 High Occupancy Vehicle (HOV) Lane To minimize traffic congestion on I-680, the Alameda Countywide Transportation Plan includes a project to construct a southbound and northbound HOV lane on the I-680 Sunol grade with ramp metering and an auxiliary lane from Highway 84 to the Montague Expressway. This project is listed in the Alameda Countywide Transportation Plan as a committed project, which means that it is a project for which funding has already been identified, but construction has not yet been completed. This project would alleviate congestion along I-680 through 2026.	Construction erosion and water quality Noise and vibration from construction Construction-period traffic Construction-period air quality	Southbound I-680 has one phase left; started construction in 2008. Northbound will not go into construction until 2009 or later.

continued

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
11	Alameda County Highway 84 Expressway This project will widen Highway 84 (Isabel Avenue) from a four- to six-lane roadway from Jack London Boulevard in Livermore through the Isabel Avenue/Valecitos Road intersection. The project will add capacity, reduce congestion, improve local circulation, and eventually tie into the Isabel Avenue/I-580 interchange project.	Construction-related traffic on regional roads (e.g., Valecitos/I-680 ramps)	2008-2012
12	Alameda County Highway 84 Safety Project Improvement of roadway along Niles Canyon Road (Highway 84) between Rosewarne Bridge and Farwell Bridge, including widening road shoulders, improving site distance and vertical clearances at bridges, and installing a retaining wall along a section of Alameda Creek.	Impacts on sensitive habitats and species Water quality impacts on Alameda Creek Cultural (archaeological) impacts Construction-related traffic on regional roads (e.g., Highway 84 and Highway 84/I-680 interchange) Wildfire hazards	2007-2009
13	Alameda County Water District (ACWD) Alameda Creek Watershed Steelhead Restoration This project involves construction of projects to improve steelhead migration in Alameda Creek. The projects are within the Alameda Creek Flood Control Channel adjacent to Quarry Lakes Regional Recreation Area in Fremont. The Rubber Dam No. 2 project would remove the fabric portion of the dam and a section of the dam's foundation. The Alameda Creek Pipeline No. 1 Fish Screen project, located upstream adjacent to Rubber Dam No. 3, involves installation of a diversion screen to eliminate potential entrainment of out-migrating juvenile steelhead. The Rubber Dam No. 3 project would involve the design and installation of a fish ladder.	Impacts (beneficial) on sensitive species and habitats Water quality impacts Impacts on recreational resources (Quarry Lakes Regional Park)	2007-2011
14	Geary Road Bridge This project involves construction of a new steel bridge at the end of Geary Road, crossing Alameda Creek in the Sunol Wilderness. A nearby existing timber bridge would remain in place.	Construction-related traffic on Calaveras Road and associated air quality and noise impacts Construction-related impacts on water quality Visual/aesthetic impacts of the proposed steel bridge in a wilderness setting	2010

continued

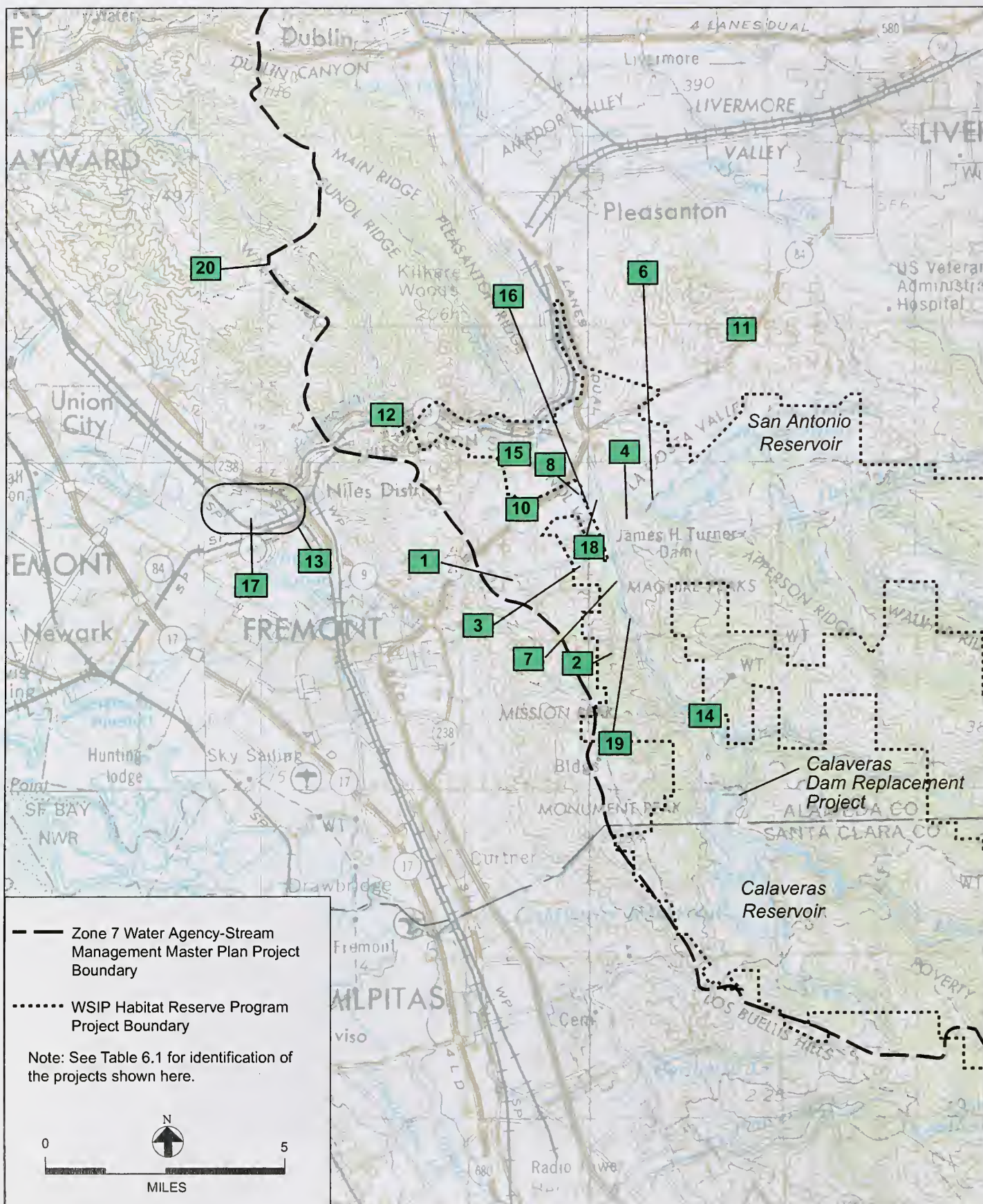
Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
15	Hanson Quarries This project involves continuation and expansion of three Surface Mining Permits (SMPs) east of Calaveras Road, north of I-680. SMP-24 is an existing 202-acre quarry and processing operation; the permit allows increased aggregate extraction and deepening of pits from 140 feet up to 250 feet. SMP-32 allows for new quarry operations on 240 acres with materials processed at SMP-24. SMP-33 is a 31-acre quarry; the permit allows deepening of pits from 140 feet to up to 200 feet, footprint expansion by 6 acres to the east for a total of 37 acres, and materials processed at SMP-24.	Impacts on sensitive habitats and species Water quality impacts on nearby creeks (e.g., Alameda Creek) Visual impacts from Calaveras Road, a designated scenic highway Traffic impacts on regional roads (e.g., I-680) and Calaveras Road Wildfire hazards Air quality effects	Ongoing to 2045+
16	PG&E Gas Line Crossing (Drop Structure) This project would modify the cement-armored Pacific Gas and Electric Company gas pipeline crossing of Alameda Creek in the Sunol Valley upstream of the confluence with San Antonio Creek, which likely poses a barrier to fish migration at most water flows. This project involves modification of the concrete mat or construction of a fish ladder to allow fish passage.	Impacts (beneficial) on fisheries Construction-related traffic on Geary Road north of Geary Road and associated air quality and noise impacts Disruption of utility service Temporary visual impacts on views from Calaveras Road Construction noise Wildfire hazards	Proposed start 2010/11
17	Rubber Dam No. 1 and BART Weir Fish Passage Project This is a joint project between the Alameda County Flood Control and Water Conservation District, and Alameda County Water District (ACWD). The project is located in the City of Fremont within the Alameda Creek Flood Control Channel at the flood control drop structure (Bay Area Rapid Transit [BART] weir) adjacent to the Quarry Lakes Regional Recreation Area. This project will consist of design and installation of a fish ladder along the northern embankment over ACWD's Rubber Dam No. 1 and BART weir.	Access by listed steelhead to Alameda Creek in the project area (which is upstream of the BART weir)	The initial goal was to complete this project by 2010.

continued

Table 6.1: Cumulative Projects Related to the CDRP in the Sunol Valley Region¹ - (Continued)

Cumulative Project No.	Project Name/Description	Potential Cumulative Impact Topics	Estimated Construction Schedule
18	SMP-30 Cemex Quarry Expansion Cemex operates the quarry east of Alameda Creek in Sunol Valley on Calaveras Road. The SFPUC owns the property for this quarry and is currently seeking a new operator. The quarry operator will install a slurry cutoff wall to reduce the inflow of water from Alameda Creek and San Antonio into the active mining pit on the premises. The cutoff wall along Alameda Creek will be approximately 7,800 feet long at an estimated depth of 35 to 45 feet. The quarry operator will also restore the right bank of Alameda Creek and the left bank of San Antonio Creek with native vegetation.	Impacts on sensitive habitats and species Aesthetic effects associated with potential expansion of the facility Construction-period traffic Air quality	Continued mining under existing permit from 2008 to 2011; in 2011 a new permit would be required.
19	Sunol Bridge Replacement This project would replace an existing one lane wooden bridge.	Construction-related traffic on Calaveras Road and associated air quality and noise impacts	TBD
20	Zone 7 Water Agency—Stream Management Master Plan Improvements The master plan contains 49 projects to be implemented over 20 years throughout the Zone 7 service area in the Tri-Valley Area. Reach 10 includes Arroyo de la Laguna. Proposed activities include bank stabilization and protection features, grading and terracing of eroded banks, riparian corridor enhancement for 3,000 feet, and removal of barriers to steelhead fish migration.	Construction erosion Water quality Habitat disturbance Construction-period air quality	2008–2030
<i>Note:</i> ¹ See Figure 6.1 for the locations of these projects. <i>Source:</i> Agency consultation and review of available documents			



SOURCE: EDAW&Turnstone JV

CALAVERAS DAM REPLACEMENT PROJECT

FIGURE 6.1: LOCATION OF CUMULATIVE PROJECTS IN THE SUNOL VALLEY REGION

The CDRP would not change the demand for recreational resources. In general, past projects in the Sunol Valley area have not increased the demand for recreational resources, nor have past projects degraded or restricted access to currently available recreational resources. However, ongoing and future projects summarized in Table 6.1 could disrupt access to recreational resources if they resulted in substantial amounts of truck traffic or lane closures on Calaveras Road. The Alameda Siphon No. 4 Project would include lane closures on Calaveras Road. The CDRP and New Irvington Tunnel projects would contribute substantial numbers of daily truck trips to Calaveras Road north of Geary Road. Calaveras and Geary Roads provide access to the Sunol and Ohlone Wilderness areas and the Ohlone Trail that connects these wilderness areas to the Mission Peak Regional Preserve. The lane closures and cumulative truck traffic could combine to significantly affect access to recreational areas. Mitigation Measure 5.12.4a in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, would reduce the project's contribution to this impact to a less-than-significant level.

The CDRP would include temporary closures of Calaveras Road from Geary Road south to Felter Road (on weekdays for 2 months in 2011 and on weekdays for approximately 18 months beginning in winter 2012). The closures are not expected to limit access to the nearby recreational facilities on most weekend days, but they would require weekday users of the Sunol and Ohlone Wilderness areas to access these facilities via Calaveras Road from the north using I-680 or Highway 84, rather than traveling northbound on Calaveras Road from the Milpitas area. Given the temporary nature of the lane closures and the existence of alternate access routes, closure of this segment of Calaveras Road would not contribute to significant cumulative impacts on access to recreational areas.

In addition to providing access to recreational facilities, Calaveras Road is and has been used for regional bicycle races and recreational rides sponsored by local bicycle clubs. The closures of a portion of Calaveras Road associated with the CDRP and the lane closures associated with the Alameda Siphon No. 4 Project, if they were to occur at the same time, could temporarily restrict cyclists' use of the road and result in a cumulatively significant impact on a recreational use. However, the planners of organized cycling events that include Calaveras Road could select alternate routes for their events, as has occurred in the past for other reasons. Given the temporary nature of the closures and the existence of alternate bicycle routes, the CDRP's contribution to this cumulative impact would be less than significant.

The truck traffic associated with the CDRP, in conjunction with the truck traffic from the cumulative projects, could cause deterioration of the roadway pavement surface beyond normal wear and tear. If the pavement condition were to deteriorate so badly that it caused vehicle damage, safety hazards, or substantial discomfort to motorists, recreationists could be discouraged from using the East Bay Regional Park District (EBRPD) facilities in southern Sunol Valley. Should such damage occur, the SFPUC would repair the road to its original condition, in

accordance with Mitigation Measure 5.12.4a in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project. Moreover, the Alameda County Public Works Agency conducts regular inspections of Calaveras Road and is committed to performing required maintenance. Under existing programs and with implementation of Mitigation Measure 5.12.4a, the road would not become badly deteriorated, and the CDRP's contribution to this cumulative impact would be reduced to a less-than-significant level.

6.2.3.2 Vegetation and Wildlife

The geographic scope of cumulative impacts on vegetation and wildlife resources is the Alameda Creek watershed. All of the projects in Table 6.1 are included in this analysis, as many of the resources affected by the CDRP could also be affected by these projects. Past development, particularly in the northern part of the Sunol Valley near I-680 and elsewhere (such as roadways, mining, and water infrastructure), has resulted in the baseline conditions of the study area today, including the relative rarity of special-status species, the current state of riparian vegetation and other sensitive natural communities, and the extent of wetlands and waters.

Construction activities for and operation of the CDRP would remove or diminish the quality of oak woodlands; serpentine grasslands; habitats for special-status plants, such as the most beautiful jewel-flower; upland habitat for California tiger salamander, California red-legged frog, and Alameda whipsnake; riparian vegetation including habitat for resident rainbow trout, foothill yellow-legged frog, and California red-legged frog; and wetland habitats.

The cumulative projects in the Sunol Valley would remove or diminish the quality of annual grassland, mixed evergreen forest/oak woodlands, scrub, wetlands, and aquatic and riparian areas and may kill, injure, or harass many of the same special-status species potentially affected by the CDRP and remove or diminish the quality of their habitats, including California red-legged frog, California tiger salamander, Alameda whipsnake, foothill yellow-legged frog, pond turtles, nesting raptors, and special-status bird and bat species. In addition to the CDRP, other projects that could affect habitats and special status species found within the Alameda Creek watershed include the New Irvington Tunnel (NIT), SVWTP, Alameda Siphon No. 4 Project, San Antonio Backup Pipeline (SABPL) Project, San Antonio Reservoir Hypolimnetic Oxygenation System (SARHOS) Project, Upper Alameda Creek Filter Gallery Project (UACFGP), Alameda County Highway 84 Safety Project, Alameda Creek Watershed Steelhead Restoration, Hanson Quarries, SMP-30 Cemex Quarry Expansion, and Zone 7 Water Agency – Stream Management Master Plan Improvements projects.

Construction of CDRP would affect habitats around Calaveras Reservoir, approximately 2 miles south of the closest project (the SVWTP project) listed above. The most substantial effect of CDRP construction on those habitats would be related to water quality, specifically to discharge of sediment and contaminants that could affect downstream wetlands and riparian resources.

Operation of the CDRP would affect stream habitat on Alameda Creek in the same area as many of the projects in Table 6.1. Construction of the NIT and Alameda Siphon No. 4 projects would affect the area along and west of Alameda Creek near the Alameda West Portal. These projects include construction of a temporary bridge across Alameda Creek just downstream of the planned retrofit of the existing bridges. The SVWTP project may also place tunnel spoils in the North Spoils site. Construction associated with the SABPL project would affect disturbed areas to the north of the Alameda Siphon No. 4 project area and other habitats along Calaveras Road. The SMP-30 Cemex Quarry Expansion project would likely result in loss of grassland north of the Alameda Siphon No. 4 project area. The UACFGP would affect Alameda Creek a little over 4 miles north of the project footprint. The SARHOS project would affect terrestrial and reservoir habitat at San Antonio Reservoir. The Alameda County Highway 84 Safety Project could affect terrestrial and aquatic habitat in Niles Canyon on Alameda Creek. The Alameda County Water District (ACWD) Alameda Creek Watershed Steelhead Restoration project would affect aquatic habitat in Alameda Creek north of I-680. The Zone 7 Water Agency – Stream Management Master Plan Improvements would affect riparian and aquatic habitat on Arroyo de la Laguna.

These cumulative projects would affect same habitat types or habitats similar to those affected by the CDRP in the Alameda Creek watershed. Therefore, there is potential for significant cumulative impacts on annual grassland; mixed evergreen forest/oak woodlands; scrub; wetlands; and aquatic and riparian areas that could provide habitat for California red-legged frog, California tiger salamander, Alameda whipsnake, foothill yellow-legged frog, pond turtles, nesting raptors, and special-status bird and bat species. The CDRP could contribute considerably to these significant cumulative impacts.

The CDRP would be subject to numerous mitigation measures that would serve to reduce the project's contribution to cumulative impacts. Mitigation Measure 5.4.1 in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, would require pre-construction measures including surveys, avoidance of sensitive habitats, establishment of protective buffers, installation of exclusion fencing, re-location of sensitive species from within the work area, worker training, and construction monitoring for wetlands and streams; California red-legged frog; California tiger salamander; Alameda whipsnake; callippe silverspot butterfly; foothill yellow-legged frog; bald eagle, golden eagle, burrowing owl and other raptors; songbirds; bats; and most beautiful jewel-flower and Diablo helianthella. Mitigation Measure 5.4.2 would require the restoration of disturbed habitats. Mitigation Measure 5.4.3 would require compensation for unavoidable impacts on wetlands and streams, riparian habitat, aquatic and upland habitat for the California tiger salamander and California red-legged frog, Alameda whipsnake, callippe silverspot butterfly, annual grasslands, serpentine grasslands, and oak woodlands through habitat creation or enhancement.

The PEIR describes potentially significant cumulative impacts on biological resources in the SFPUC Alameda Watershed resulting from the WSIP in conjunction with other past, present, and foreseeable future projects as bioregional effects, operating beyond the level of individual plants or animals, such as:

- Genetic diversity impacts on small populations that become reduced and isolated by development;
- Impacts on wildlife movement related to habitat fragmentation;
- Suppression of natural disturbance regimes (e.g., fire, flood) as projects are constructed, operated, and maintained; and
- Reduced population recovery opportunities from stochastic events (e.g., random events such as disease).

The PEIR determined that compliance with applicable state and federal regulations, general plan conservation measures, and project-specific permitting requirements would mitigate these bioregional effects to some extent, but included a mitigation measure (Mitigation Measure 4.16.4a) to provide additional regional protection of affected biological resources to ensure that the WSIP's contribution to these cumulative bioregional effects would be less than significant. PEIR Mitigation Measure 4.16.4a requires the SFPUC to address bioregional effects when implementing habitat compensation mitigation required for individual WSIP facility projects. The measure identifies the following conservation principles to be considered in developing habitat compensation mitigation measures for individual WSIP facility projects:

- The parcels are either contiguous with other areas of relatively undisturbed habitat or are themselves large enough to support most of the species associated with the habitat;
- The distribution of mitigation lands will allow movement of plants and animals between them or from them to habitats otherwise conserved; and
- Implementation of habitat compensation mitigation for individual WSIP facility projects will be combined and implemented through a coordinated program with other mitigation efforts, such as through the Habitat Reserve Program (HRP), and shall meet these standards:
 - Long-term management of these lands stipulates maintaining natural disturbance regimes (e.g., through prescribed burning);
 - Long-term control actions for non-native species are applied; and
 - Contingencies are considered which address sharing biological materials and information with other conservation land stewards.³ This might include restoring suitable sites with plants brought from another protected area once a weed infestation has been brought under control, or animal relocation if done strictly for the purpose of genetic diversity or recovery, and with the approval of the regulatory agencies.

³ For example, the California Department of Parks and Recreation (CDPR), East Bay Regional Park District (EBRPD), and the Midpeninsula Regional Open Space District (MROSD).

Consistent with these conservation principles, the mitigation sites identified in Mitigation Measure 5.4.3 (in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project) for habitat compensation impacts of the CDRP on biological resources are contiguous with other areas of relatively undisturbed habitat and in most cases are themselves large enough to support most of the species associated with the habitat. The mitigation sites are located within the SFPUC Alameda Watershed, which is not subject to development pressure and is managed under the SFPUC's adopted Alameda Watershed Management Plan. These areas are also located within the larger watershed area (47,800 acres) that would be managed under the proposed Alameda Watershed Habitat Conservation Plan when that plan is adopted. For this reason, the mitigation sites within the watershed would allow movement of plants and animals between them or from them to habitats otherwise conserved. The habitat compensation mitigation plans for the CDRP have been closely coordinated with compensation mitigation plans for other WSIP facilities projects in conjunction with the SFPUC's development of its proposed HRP and provide for monitoring, long-term management, controls for invasive species, and adaptive management. The monitoring provision specified in Mitigation Measure 5.4.3i includes collaboration with relevant ongoing studies, such as monitoring foothill yellow-legged frog and California red-legged frog by the EBRPD. For this reason, the project-level mitigation required for the CDRP would ensure that implementing the proposed project would not result in a significant cumulative impact.

6.2.3.3 Fisheries and Aquatic Habitat

The geographic scope of cumulative impacts on fisheries and aquatic habitat is the Alameda Creek watershed.

Construction and operation of the CDRP and Alameda Creek Diversion Dam (ACDD) bypass would affect native fish species such as rainbow trout.

The cumulative projects in the Sunol Valley would affect stream, wetlands, and riparian areas and may affect many of the same fish species potentially affected by the CDRP. In addition to the CDRP, other SFPUC projects that could affect habitats and species found within the Alameda Creek watershed include the SVWTP, Various Pipeline Inspection, Upper Alameda Creek Filter Gallery, and SMP-30 Cemex Quarry Expansion projects. These projects could include construction discharges that could affect the water quality in Alameda Creek and its habitat for common and special-status species.

As discussed in Section 4.5, Fisheries and Aquatic Habitat, the Alameda Creek watershed historically contained populations of anadromous steelhead, resident rainbow trout, and several other native fish species. Water supply projects, gravel mining, urban development, and flood control modifications have resulted in altered habitat and reduced this historical fishery throughout the watershed.

Alameda Creek, Calaveras Creek, Calaveras Reservoir, Arroyo Hondo, and tributaries currently provide habitat for a diverse assemblage of native and non-native fishes; a total of 14 native and at least 13 non-native fish species have been observed in nontidal portions of the Alameda Creek watershed during the past century (Gunther et al. 2000). The upper reaches of Alameda Creek support a reproducing population of resident rainbow trout, and Arroyo Hondo, a tributary to Calaveras Creek upstream of Calaveras Reservoir, is known to contain self-sustaining populations of resident rainbow trout that utilize the reservoir for a portion of their life history. Young-of-year trout have been also observed in Stonybrook Creek and Sinbad Creek, both tributaries of Alameda Creek (Gunther et al. 2000).

Construction of the CDRP and nearly all the projects identified in Table 6.1 include construction activities that could adversely affect water quality and associated aquatic habitats and fisheries resources in the watershed. Construction activities could result in temporary increases in sediments and turbidity, and temporary release and exposure of contaminants adversely affecting aquatic habitats and fish populations. The CDRP, SVWTP, and Alameda Siphon No. 4 projects would all involve the potential use of drilling fluids during tunneling operations, which could have significant adverse impacts on fisheries and aquatic habitat if spilled or discharged into Alameda Creek. As such, construction of the CDRP and other projects in the watershed could result in significant cumulative impacts on fisheries and aquatic habitat.

Given the scale and duration of the project construction activities, the CDRP's contribution to construction-related cumulative impacts on fisheries and aquatic resources would be cumulatively considerable. The CDRP would be undertaken in accordance with a project-specific Storm Water Pollution Prevention Plan (SWPPP) as reviewed and approved by the RWQCB. As identified in Mitigation Measure 5.7.1 in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, the SWPPP would require implementation of extensive best management practices (BMPs) during project construction as well as post-construction site restoration and stabilization to control erosion and sedimentation and to prevent the discharge of pollutants into Alameda Creek and other waterways. In addition, Mitigation Measure 5.7.2 includes measures to prevent spills or accidental discharges of drilling fluids and requires that any drilling fluids used during construction to be properly disposed. Implementation of these measures would reduce the proposed project's contribution to cumulative impacts to a less-than-significant level.

Cumulative impact analysis for future steelhead in the watershed is provided below and considered the projects listed in Table 6.1.

Although the presence of steelhead in Alameda Creek upstream of the Bay Area Rapid Transit District (BART) weir is not an existing condition as defined by CEQA, it is likely that steelhead will occur there in the future as a result of the cumulative implementation of many planned and

proposed projects and actions designed to restore steelhead in Alameda Creek. This section of the fisheries and aquatic habitat cumulative impact analysis examines the potential effects of the CDRP under a “future cumulative scenario” in which it is assumed that steelhead access to the watershed has been restored upstream of the BART weir. Because it is possible that steelhead access could be restored before completion of construction, the analysis addresses potential effects that could result from both construction and operation.

The Alameda Creek watershed historically supported a steelhead run, with spawning likely occurring primarily in the upper reaches of the watershed. This steelhead run was eliminated over the past century by the placement of several obstructions to migration within the Alameda Creek channel. Major alterations to Alameda Creek and its tributaries include the channelization of the lower 12 miles of the creek for flood control; the construction of three diversion dams by ACWD in the flood control channel; the construction of the Pacific Gas and Electric Company (PG&E) pipeline concrete apron drop structure; the construction of Calaveras Dam, the ACDD, Turner Dam, and Del Valle Dam for water supply; and the construction of the BART weir. These alterations have reduced the quality of habitat within the watershed and eliminated access for steelhead to the upper watershed (Gunther et al. 2000). Despite the SFPUC’s recent removal of Sunol and Niles Dams, steelhead can migrate upstream only as far as the BART weir. The combined effects of past and present projects (including other changes to the creek detailed in the Environmental Setting section of Section 4.5, Fisheries and Aquatic Habitat) have resulted in a significant adverse cumulative impact on steelhead in the Alameda Creek watershed.

Many of the reasonably foreseeable future projects identified in Table 6.1 would improve future conditions for steelhead through removal of fish migration barriers from Alameda Creek and its major tributaries, enhancement of fish and riparian habitats, and reduction of sedimentation. In the northern part of the watershed, the proposed Chain of Lakes project would provide recharge for Zone 7’s Arroyo de la Laguna groundwater basin and would both reduce peak flows and capture substantial quantities of sediments, thereby preventing their transport downstream. In the southern part of the watershed, the SMP-30 Cemex Quarry Expansion project would continue current mining but would include a slurry cutoff wall that is expected to reduce seepage from Alameda Creek to the quarry pits, thereby increasing surface water flows in the creek channels and benefiting riparian habitats and fish there and downstream and improving connectivity to the upper portions of the watershed. Conversely, the SFPUC UACFGP (Cumulative Project No. 8) would recover water released from the Calaveras Dam or bypassed at the ACDD pursuant to the requirements of the 1997 MOU to improve aquatic habitat downstream of these facilities. As part of the agreement to release water to improve habitat for resident rainbow trout and other fishes, the MOU specifically provides for a future recapture project. Under its current preliminary approach to recapture, the SFPUC would recover the water downstream via an infiltration gallery (perforated pipes) to be constructed directly beneath the streambed of Alameda Creek just upstream of the confluence of Alameda and San Antonio Creeks. A maximum recapture up to 20

cubic feet per second (cfs) is under consideration by the SFPUC. These projects would be subject to their own environmental review and permitting, including documentation that will detail any potential significant environmental impacts and mitigation requirements related to steelhead.

Overall, the combined effect of these and other future projects is expected to improve habitat conditions for steelhead compared to current conditions and allow for the migration of steelhead upstream of the BART weir. However, the environmental conditions in the Alameda Creek watershed for steelhead, even with these future projects, would remain limited. As at present, steelhead would not have access to historic spawning and rearing habitat upstream of the Calaveras Dam, the ACDD, Turner Dam, and Del Valle Dam. Flows in Calaveras, Alameda, and San Antonio Creeks and in Arroyo de la Laguna would continue to be modified by the operations of the various water supply and flood control systems in the watershed. Although improved by the identified cumulative projects and implementation of the CDRP, the modified flows would continue to present limitations to steelhead.

The following analysis evaluates the potential cumulative impacts on steelhead when considering the CDRP in combination with other past, present, and reasonably foreseeable future projects. The analysis considers future conditions under the assumption that the fish passage barrier removal and other habitat improvement projects identified in Table 6.1 have been implemented and that steelhead access has been successfully restored in the upper Alameda Creek watershed. As noted above, because it is possible that steelhead access could be restored before completion of construction, the analysis addresses potential effects that could result from both construction and operation of the proposed CDRP.

Construction Impacts

This analysis considers the potential cumulative impacts of the CDRP on steelhead if steelhead regain access to upper Alameda Creek before completion of construction. For this analysis, it is assumed that (1) DSOD restrictions on Calaveras Reservoir water level remain in place during the construction period; (2) two periods of shutdown of the outlet works would occur during construction as described in the project description, providing no means for releases from the outlet works during those periods; and (3) there would be no recapture of flows downstream (i.e., it is assumed that the UACFGP would not be constructed or at least operational until after the CDRP construction is completed).

Rainy season flows over the ACDD during construction would partially meet the ACDD bypass flows prescribed in the steelhead flow release schedules proposed under the CDRP. However, until construction of the proposed ACDD bypass facility is completed, it would not be possible to provide the minimum bypass flows required under the flow release schedules during times that the diversion gates are open. As under existing conditions, all flows up to 650 cfs could be diverted to the reservoir when the diversion gates are opened until construction of the bypass

tunnel is completed. In addition to bypass flows at the ACDD, the flow release schedules also require releases from Calaveras Reservoir to supplement flows when sufficient natural flows are not available in Alameda Creek and to provide cold-water releases to maintain suitable temperature conditions during summer. During portions of the construction period, releases could be made from the reservoir if needed to meet the flow release schedules. However, as discussed in Section 3.5.6, Operation of the Reservoir during Construction, the flow release schedules would not be fully implemented until construction is complete, and it may be infeasible to release water from Calaveras Dam during the two periods that the reservoir outlet works would be shut down for construction (approximately mid-April to mid-November in either 2011 and 2012 or 2012 and 2013). Therefore, it would not be feasible to implement the proposed steelhead flow release schedules until construction of the ACDD bypass tunnel is completed and/or during the two outlet works construction periods.

During project construction, the reservoir would be operated in a manner similar to the DSOD-restricted baseline condition (see Section 3.5.6, Operation of the Reservoir during Construction). The reservoir would be maintained between elevation 690 feet and 705 feet, and water would be released to the SVWTP through the outlet structure or to Calaveras Creek through the cone valve as necessary to maintain the reservoir within these limits. During periods when no releases are being made through the cone valve, base flows would be provided by seepage under the dam similar to the baseline condition. As during the baseline period, no spills would occur during construction because of the reduced reservoir elevation. Diversions from Alameda Creek would be limited to avoid excess storage and potential inundation of the haul road to Borrow Area E. For this reason, more natural runoff would be allowed to flow over the ACDD and down Alameda Creek during the construction period than during the CEQA baseline period. Therefore, although it would not be feasible to implement the proposed steelhead flow release schedules until construction is complete, streamflow conditions for steelhead in Alameda Creek downstream of the ACDD and downstream of the Calaveras Creek confluence would be the same or better than during the CEQA baseline period. For this reason, the effects of the CDRP on Alameda Creek streamflow conditions for steelhead during project construction would not result in a considerable contribution to a cumulative significant impact (no impact).

If steelhead regain access to upper Alameda Creek during project construction, steelhead could be affected by construction-related water quality impacts. Construction of the CDRP and nearly all the projects identified in Table 6.1 include construction activities that could adversely affect water quality and associated aquatic habitats and fisheries resources in the watershed. Construction activities could result in temporary increases in sediments and turbidity and in temporary release and exposure of contaminants adversely affecting steelhead. The CDRP, SVWTP, and Alameda Siphon No. 4 projects would all involve the potential use of drilling fluids during drilling and/or tunneling operations, which could have significant adverse impacts on steelhead if the fluids are spilled or discharged into Alameda Creek. For this reason, construction

of the CDRP and other projects in the watershed could result in significant cumulative water quality impacts on steelhead if they are present in upper Alameda Creek when these projects are under construction.

Given the scale and duration of the project construction activities, the CDRP's contribution to construction-related water quality impacts on steelhead would be cumulatively considerable. As discussed above, the CDRP would be undertaken in accordance with a project-specific SWPPP. As identified in Mitigation Measure 5.7.1 in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, the SWPPP would require implementation of extensive BMPs during project construction as well as post-construction site restoration and stabilization to control erosion and sedimentation and to prevent the discharge of pollutants into Alameda Creek and other waterways. In addition, Mitigation Measure 5.7.2 includes measures to prevent spills or accidental discharges of drilling fluids and requires that any drilling fluids used during construction be properly disposed of. Implementation of these measures would reduce the proposed project's contribution to cumulative impacts to a less than cumulatively considerable level (less than significant).

Operational Impacts

Under the proposed CDRP, future operations of Calaveras Reservoir and the ACDD would include the following provisions designed to improve habitat conditions for native fishes in the watershed:

- Bypass flows at the ACDD and flow releases from Calaveras Reservoir pursuant to the flow schedule identified in the 1997 MOU (see Project Description, Section 3.6.5);
- Flow release schedules proposed to support steelhead spawning, egg incubation, and rearing when fish passage barriers have been resolved and steelhead are present in upper Alameda Creek (see Project Description, Section 3.6.6);
- ACDD operational criteria to pass flows down Alameda Creek when diversion of flows is not required to maintain Calaveras Reservoir storage levels (see Project Description, Section 3.6.4); and
- Operational procedures for Calaveras Dam releases to avoid cone valve testing during spawning and egg incubation periods (see Project Description, Section 3.6.3).

As noted above and further discussed in Section 3.6.6, the SFPUC proposes to implement flow release schedules for steelhead as part of the proposed future operations of the CDRP. These flow release schedules, which would replace the flow releases proposed for resident rainbow trout when the steelhead have regained access upstream of the BART weir as determined by the National Marine Fisheries Service (NMFS), specify the *minimum* flow releases that the SFPUC is committing to as part of the proposed CDRP. The proposed flow release schedules are subject to

review and approval by NMFS in accordance with the Federal Endangered Species Act (FESA).⁴ For this reason, the proposed steelhead flow release schedules may be adjusted through the federal permitting process during consultation with NMFS.

Figure 4.6.6 illustrates the minimum instream flows at the confluence of Alameda and Calaveras Creeks under the flow release schedules that the SFPUC proposes to implement under the CDRP when steelhead are present in the upper Alameda Creek watershed as compared to baseline DSOD-restricted conditions. As further discussed in Calaveras Dam Replacement Project: Future Cumulative Impacts Analysis – Central California Coast Steelhead Technical Memorandum (Appendix J), the CDRP would improve steelhead habitat in the watershed by providing suitable hydrologic and temperature conditions to support steelhead spawning, egg incubation, and rearing throughout the primary study area by:

- Providing suitable water velocities and water depths during spawning and egg incubation periods through bypasses at the ACDD and/or releases from Calaveras Reservoir; and
- Reducing water temperatures, maintaining pool depths, and improving water quality during critical summer rearing periods through cold-water releases from Calaveras Reservoir.

Although the proposed steelhead flow release schedules are expected to provide suitable habitat conditions to support steelhead spawning, egg incubation, and rearing, the specific streamflow conditions needed to support future steelhead migration in upper Alameda Creek are less certain at this time. The preliminary data collected in portions of the lower Sunol Valley are not conclusive, but they suggest that flows in the range of 1 to 46 cfs may meet passage criteria for adult steelhead and that flows in the range of 1 to 12 cfs may be sufficient to meet passage criteria for downstream migration of steelhead smolts (i.e., juveniles) at several wide channel areas where riffles may limit passage at lower flows (URS and HDR, unpublished data). However, because of losses in streamflow from percolation to groundwater in this reach, the magnitude of in-migration flows in Alameda Creek needed to achieve these levels of flow in the Sunol Valley is uncertain. Channel losses have been estimated as high as 30 to 40 percent through this reach, depending on the time of year and antecedent hydrologic conditions (ENTRIX 2006). The slurry cutoff wall, which is anticipated to be constructed as part of the Sunol Valley Aggregate Quarry project would improve streamflow and fish passage conditions in this reach of the creek. However, the degree to which these projects would reduce in-migration flow requirements needed to achieve fish passage is difficult to predict.

Under both existing conditions and pre-DSOD operations, high flows that exceed the 650 cfs capacity of the diversion tunnel flow over the ACDD and down Alameda Creek whenever they occur. These short-duration high flows or pulse flows, which are important to support steelhead

⁴ The U.S. Fish and Wildlife Service also would have FESA permitting authority for release schedules with respect to other potentially affected protected species, such as California red-legged frog.

migration, would continue to occur during both construction and future operations of the CDRP. However, as a result of the uncertainties regarding the future conditions that would result from implementation of the future cumulative projects in the Sunol Valley, specific flow release criteria necessary to support in-migration of adult steelhead and out-migration of steelhead smolts (and any adults that may return to the ocean after spawning) through the quarry reach in Alameda Creek and downstream to the confluence with Arroyo de la Laguna were not available at the time of publication of this Draft EIR. Specifically, there is uncertainty regarding:

- The effectiveness of the future slurry cutoff wall in reducing mining pit capture of surface water flows at the Sunol Quarry (SMP 30);
- The effectiveness of future habitat enhancements in addressing passage at the existing critical riffles along the segment of Alameda Creek adjacent to the Sunol Quarry (SMP 30);
- The amount of flow required to allow for steelhead passage in the area of the to be modified PG&E gas pipeline concrete apron drop structure;
- The amount of flow required to allow for steelhead passage in the area of the BART weir and ACWD middle rubber dam;
- The amount of flow required to allow for steelhead passage in the area of the ACWD upper rubber dam; and
- The specific location and operational aspects of the UACFGP.

The SFPUC would continue to coordinate with the other project proponents, resource agencies, water resource management entities, and other stakeholders during the development and implementation of these future projects to better understand how the proposed project would affect streamflow and other habitat conditions for steelhead. In addition, because steelhead are not currently present in the upper Alameda Creek watershed, important information about specific steelhead migration behavior in the watershed is limited. Additional monitoring will be required after steelhead have regained access to the upper watershed to fully understand the specific migration requirements for steelhead in Alameda Creek such as timing and specific triggers for migration under varying water year conditions. As a result of the uncertainties about the effects of future projects on streamflow conditions and the lack of available information on steelhead migration requirements in the watershed, specific flow release schedules for Calaveras Reservoir and the ACDD to support future steelhead migration in upper Alameda Creek cannot be accurately determined at this time. However, as discussed in Section 4.5, Fisheries and Aquatic Habitat, the proposed operation of the CDRP (including the flow release schedules) when steelhead are present in the watershed would result in more reliable minimum flows in upper Alameda Creek compared with existing conditions. In addition, pulse flows exceeding 650 cfs would continue to flow over the ACDD as under both existing and pre-DSOD operations. Thus, proposed CDRP flows would constitute an improvement over existing conditions.

As discussed in Section 4.5, Fisheries and Aquatic Habitat, project-related diversions and bypasses at the ACDD would also alter the frequency and magnitude of channel-forming flows that support geomorphic processes in the creek. However, project-related operation of the ACDD would result in downstream hydrologic conditions consistent with those that have influenced the form and maintained the channel over the longer period of pre-DSOD operation, which included periodic intermediate and episodic flow events well above the 650 cfs capacity of the tunnel that flowed over the ACDD and downstream. For example, Figure 4.5.3 shows periods in early 2003, 2004, and 2008 when peak flows greatly exceeded the 650 cfs capacity of the diversion tunnel. Such events are capable of substantial sediment transport and support erosion and deposition processes that affect channel morphology. Continued sluicing operations would further support these processes. However, the baseline period of DSOD-restricted operations and associated variable operation of full diversions with no bypasses (see Figure 4.5.3) is too short and too variable to have had an identifiable effect on channel form. Channel morphology is essentially similar to that which existed before 2001. Under the proposed CDRP, such conditions would continue without change.

Although, as discussed above, it is difficult to predict how future projects may affect streamflows and other habitat conditions, the proposed CDRP, with implementation of the flow release schedules explained above, is expected to improve future habitat conditions for steelhead in the Alameda Creek watershed as compared to existing conditions. Although, as in the baseline condition, the Alameda Creek watershed environmental conditions will remain limited, the CDRP would have a beneficial effect on steelhead and thus would not make a considerable contribution to the significant cumulative impact on steelhead in the Alameda Creek watershed (less than significant).

To address the uncertainties inherent in predicting future habitat conditions for steelhead discussed above, the SFPUC proposes to further refine its long-term management strategy for protection of steelhead and other sensitive aquatic and terrestrial species through the development and implementation of a Habitat Conservation Plan (HCP). The SFPUC, working with the U.S. Fish and Wildlife Service (USFWS), NMFS, and the California Department of Fish and Game (CDFG), is developing an HCP for incidental take of listed species that may result from ongoing SFPUC operations and maintenance of all of its facilities in the SFPUC Alameda Watershed, including the CDRP. The Central California Coast steelhead distinct population segment is a covered species in the proposed SFPUC Alameda Watershed HCP.

The SFPUC is committing to completing and implementing the Alameda Watershed HCP as a conservation measure in the ongoing FESA Section 7 consultation with NMFS for the proposed CDRP. The HCP is being developed in compliance with Section 10 of FESA. Under Section 10, otherwise lawful activities that may harm listed species or their habitats may be permitted. The Draft HCP is under development, with sections of the document already released for public

review. Additional sections are scheduled for public review later this year and in 2010. Based on public comment and input, the Draft HCP may be revised before release of the final plan. The HCP will require preparation of a joint environmental impact statement/environmental impact report (EIS/EIR) before the SFPUC can consider adoption and begin implementation. USFWS and NMFS will serve as the co-lead agencies under the National Environmental Policy Act, and the San Francisco Planning Department will serve as the CEQA lead agency for the EIR. The HCP will provide the SFPUC's long-term management plan for restoration of steelhead affected by SFPUC operations in the watershed.

In addition to development and implementation of the Alameda Watershed HCP, the SFPUC would continue to coordinate with CDFG and NMFS and other water resource management entities in the watershed through participation in the Alameda Creek Watershed Fisheries Workgroup. Ongoing and future studies conducted in support of both the HCP and the workgroup will provide additional information addressing habitat conditions and requirements for steelhead in the watershed.

6.2.3.4 Hydrology

The geographic scope of potential cumulative hydrology impacts consists of the project site, the surrounding watershed lands, and Alameda Creek within and downstream of the Sunol Valley. For potential cumulative impacts on hydrology, all of the projects in Table 6.1 are included in the analysis, as each of these projects could affect water flows in local creeks, flooding along local creeks, geomorphology, or groundwater conditions.

The CDRP would alter flows in Alameda Creek and Calaveras Creek as a result of changes in operation of the ACDD and Calaveras Dam and Reservoir. Flow in the creeks would be reduced in wet months (December to March) in normal, above-normal and wet hydrologic year types. Flow in the creeks would be increased or remain unchanged in all other months of all hydrologic year types. The net result of these changes would be a slight increase in the average annual amount of water flowing in Alameda Creek and no appreciable change in the average annual flow in Calaveras Creek.

A number of the projects listed in Table 6.1 have the potential to affect flow in Alameda Creek; however, the majority of the impact would be construction-period impacts during which dewatering, tunneling or construction in the creek bed could locally reduce groundwater levels in the vicinity of the creek and therefore have the potential to reduce flow through losses to groundwater. This local lowering of groundwater would be mitigated by discharge of dewatered groundwater back to the creek in the vicinity of the project, and no cumulative impact on flows in Alameda Creek or Calaveras Creek is expected as a result of construction-period activities.

The operation of three projects listed in Table 6.1 (Cumulative Projects 8, 18, and 5) have the potential to alter flow in Alameda Creek as explained below; however, the CDRP would not contribute to a significant cumulative impact.

Operation of the UACFGP, Cumulative Project No. 8 in Table 6.1, would affect flow in Alameda Creek downstream of the UACFGP. The UACFGP would withdraw up to 20 cfs of flow in Alameda Creek released upstream from the ACDD and/or Calaveras Dam to meet MOU flow requirements. The impact on Alameda Creek would be moderated once the creek joins with Arroyo de la Laguna (ADLL) by the additional flow in ADLL. The segment of Alameda Creek that would experience the most substantial reduction in flow as a result of the UACFGP project would be from the confluence with San Antonio Creek to the confluence with ADLL, approximately 1.7 miles of creek.

The CDRP, as discussed previously, would alter the timing of flows in Alameda Creek and would slightly increase average annual flows in the creek. The CDRP would release MOU flows with or without the UACFGP. With just the CDRP implemented, Alameda Creek in the reach between the UACFGP site and ADLL would experience a slightly increased amount of average annual flow, with decreased flows in wet and above-normal years, and increased flows in normal and drier years. Therefore the CDRP would not contribute to a significant cumulative impact in this reach of creek. The impact on flow from the implementation of the UACFGP will be reviewed as part of that project's EIR.

Installation of the slurry cutoff walls as part of the SMP-30 Cemex Quarry Expansion, Cumulative Project No. 18 in Table 6.1, may have the potential to increase groundwater levels in the quarry reach of Alameda Creek near the proposed UACFGP project by limiting groundwater losses to the adjacent quarry. The slurry walls installed as part of this project may increase the flow in Alameda Creek through this reach by reducing creek loss to groundwater; however, the potential increases in flow have not been quantified. As previously stated, implementation of the CDRP would cause a small net increase in flows in Alameda Creek in the reach of the creek where the slurry walls would be installed. Any additional flow generated from the slurry wall installations would partially offset the reduction in flow as a result of the CDRP during winter months or normal and wetter years and would augment increased flows in all other months. The offset of CDRP-induced reductions during winter months would be a beneficial impact. The combined increase in flow from the CDRP and the slurry wall installations is not expected to be substantial and would be well within the range of flows experienced in and below the quarry reach. Therefore, operation of the CDRP in combination with the slurry wall installation as part of the SMP-30 Cemex Quarry Expansion would partially offset some reductions experienced by the CDRP and provide a potentially beneficial increase in flow during periods of increased flow under the CDRP. Therefore, no adverse cumulative impacts would occur.

The SFPUC Various Pipeline Inspection Projects, Cumulative Project No. 5 in Table 6.1, have the potential to periodically increase flows in Alameda Creek when water from the dewatering of the pipeline(s) under inspection is discharged to Alameda Creek. This has the potential to increase flows in Alameda Creek above flow levels currently experienced. This increase could be incrementally higher if the dewatering discharge occurred during months when CDRP-induced flow increases in the creek were occurring. Releases timed in this manner would not produce a cumulative flow or flooding impact because any increase in flow would be minimal when compared with peak flows experienced in Alameda Creek during rainfall events and would be well within the range of flows normally experienced by the creek. Therefore, implementation of the CDRP in combination with the pipeline inspection projects would have a less-than-significant cumulative impact on flow in Alameda Creek.

Present and future projects summarized in Table 6.1, particularly those that may place fill or structures in the floodplain, could result in flooding impacts along Alameda Creek. The only flood-sensitive feature in or adjacent to the Sunol Valley floodplain is the ranch residence located approximately 6,800 feet from the SVWTP. This residence is more than 15 feet above the predicted 100-year flood elevation and would not be affected by floodplain encroachment from the cumulative projects. Structures altered or constructed within Alameda Creek downstream of Niles Canyon for fisheries enhancement could locally alter flow passage in that region of the creek. The CDRP would alter the ACDD and Calaveras Dam, both of which control flow in the creek; however, the revised operation of both structures would either reduce or not alter high flows that could cause flooding in Calaveras and Alameda Creeks. Further, the CDRP would improve the seismic safety of the dam, reducing the risk of dam failure during an earthquake. Therefore, implementation of the CDRP in concert with the projects listed in Table 6.1 would have no significant cumulative impact on flooding along Calaveras or Alameda Creeks.

Present and future projects listed in Table 6.1 could alter the topography and increase impervious areas in the vicinity of the Sunol Valley and the Alameda Creek watershed, resulting in downstream erosion impacts on local creeks. The CDRP would create small impervious areas through the construction of new buildings. However, existing buildings would also be demolished as part of the project. The new dam would include an impervious concrete spillway. However the spillway would largely be constructed in rock and replace an existing concrete spillway. The CDRP project would, therefore, not generate any substantial amounts of new runoff or channel the runoff in a way that would increase erosion. The CDRP would therefore not contribute to possible significant cumulative increase in erosion, and the impact would be less than significant.

Alameda Creek is a stream system that is in disequilibrium related to dams on its tributaries, in-channel obstructions (e.g., the BART weir and PG&E drop structure), land uses that affect sediment quality, and other causes that have altered the natural flow and sediment transport for

over a century. The proposed project would not substantially alter those conditions. The cumulative projects in the watershed potentially would result in temporary perturbations in sediment transport, but none would likely substantially affect the morphologically significant flows and channel-forming processes in the creek. The project, therefore, would not contribute to a significant cumulative alteration of Alameda Creek geomorphology, and the impact would be less than significant.

Ongoing and future projects summarized in Table 6.1 that include construction activities in the vicinity of Alameda Creek could cause temporary impacts on groundwater levels by construction-period pumping. As mentioned previously with regard to flow, the CDRP and other projects would locally lower groundwater in the vicinity of the project where dewatering is required during construction. The lowering of the groundwater table at each of these project sites would be a temporary and localized condition. Water from dewatering facilities would be discharged to local waterways after treatment and would likely partially re-infiltrate. Dewatering activities performed during construction of the CDRP and other projects in the watershed would therefore not cause or contribute to the lowering of regional groundwater levels. Therefore, there would be no cumulative impact.

6.2.3.5 Water Quality

The geographic scope of potential cumulative water quality impacts consists of the project site and the surrounding watershed lands. Because each of the cumulative projects could affect water quality in local creeks, all of the projects in Table 6.1 are included in the analysis.

The CDRP could cause discharges of construction-related substances, sediment, and dewatering effluent; operational discharges; submergence of former construction areas; barging operations-related turbidity or accidental spills; and discharges from blasting, pile driving, and drilling activities.

Ongoing and future projects summarized in Table 6.1 that include ground disturbance and/or discharge of water potentially containing pollutants could cause impacts on surface and groundwater quality, including water quality within local creeks. The potential impacts on surface and groundwater quality associated with the CDRP and the cumulative projects could be cumulatively significant. Given the scale and duration of the project construction activities, the CDRP's contribution to construction-related cumulative impacts on water quality would be cumulatively considerable.

As discussed above, the CDRP would be undertaken in accordance with a project-specific SWPPP as approved by the RWQCB. As identified in Mitigation Measure 5.7.1 in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, BMPs would be implemented during construction to minimize erosion and sediment

transport, accidental spills, solid waste discharges, and contact with naturally occurring asbestos (NOA) and metals from construction areas, haul roads, borrow areas, laydown/staging areas, disposal sites, the ACDD Bypass Facility, and dewatering activities. Mitigation Measure 5.7.1 requires frequent inspection and maintenance of the BMPs throughout project construction to ensure their effectiveness, and requires the SFPUC or its contractors to monitor and report on the effectiveness of the required BMPs.

As identified in Mitigation Measure 5.7.2, a Drilling Contingency Plan would be developed if drilling muds/fluids are used for drilling operations to ensure proper containment of drilling fluid; minimize the potential for an accidental discharge of drilling fluid; and ensure an organized, timely response in the event of a release of drilling fluid. This response would include notification procedures to applicable regulatory agencies and the Alameda County Water District for reporting frac-outs.

Implementation of Mitigation Measures 5.7.1 and 5.7.2 would reduce the CDRP's contribution to cumulative impacts on water quality to a less-than-significant level.

6.2.3.6 Geology, Soils, and Seismicity

The geographic scope of cumulative geologic and seismic impacts is the area surrounding the Calaveras Dam and Reservoir. These types of impacts are generally site-specific and depend on local geologic and soil conditions.

Past projects, including historic SFPUC water transmission projects and ongoing mining operations, have modified the topographic and geologic landscape in the vicinity of the project site. The CDRP is intended to improve the ability of the Calaveras Dam to withstand strong earthquakes. Other SFPUC water system projects are also intended to improve the seismic safety of the facilities. Therefore, the CDRP would cumulatively contribute to a beneficial effect related to seismic safety in the Sunol Valley and the Alameda Creek watershed. Other potential geologic and seismic impacts associated with the CDRP, such as slope stability during construction, and mitigation measures identified to reduce these impacts would be site-specific.

None of the projects listed in Table 6.1 would contribute to any potential geohazards at the project site, including landslides, squeezing ground within the tunnel, fault rupture, ground shaking, liquefaction, and adverse soil conditions. These projects and the associated impacts would occur at some other location. Similarly, the proposed project would not contribute to impacts associated with these other projects such that a significant cumulative impact would result outside of the CDRP area. Thus, the CDRP would neither contribute to regional geologic or seismic safety impacts nor combine with other local projects to contribute considerably to localized cumulative impacts, and cumulative impacts related to geology, soils, and seismicity would be less than significant.

As described in Section 4.8, Geology, Soils, and Seismicity, the CDRP could result in soil loss from construction activities as well as erosion from wind and stormwater runoff. The potential soil loss associated with the CDRP and the cumulative projects would be cumulatively significant, and the CDRP contribution would be cumulatively considerable. However, implementation of soil erosion protection measures discussed in Impact 4.7.1 in Section 4.7, Water Quality, and described in detail in Mitigation Measure 5.7.1, Stormwater Pollution Prevention Plan, in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, during construction and development and implementation of post-construction soil stabilization and revegetation plans, would reduce this impact to a less-than-significant level.

6.2.3.7 Hazards and Hazardous Materials

The geographic scope for these impacts includes the lands surrounding the reservoir, the Calaveras Road corridor, and the Sunol Valley region.

Past projects and local activities (including SFPUC water conveyance facilities and agricultural operations) may have resulted in the release of contaminants such as petroleum hydrocarbons and pesticides to the subsurface. However, the areas proposed for excavation in the CDRP have not been identified as sites containing previously discharged contaminants. Therefore, the CDRP would not contribute to cumulative impacts related to the release of contaminants. In addition, due to the site-specific nature of this type of hazardous materials impact, only projects that would occur at or adjacent to the project site could cause releases of contaminants to the surface and subsurface that would potentially result in a cumulative impact related to hazardous materials. None of the projects listed in Table 6.1 would be constructed at or adjacent to the CDRP site, so no cumulative impact associated with the release of contaminants would occur. Cumulative impacts resulting from contaminant releases into waterways are discussed above in Section 6.2.3.5, Water Quality.

The CDRP could result in the release of hazardous materials during construction, exposing workers and others in the vicinity of the project to elevated contaminant levels. Most, if not all, of the projects described in Table 6.1 would involve the use of hazardous materials. Some of the same workers may be involved with the CDRP and other projects described in Table 6.1. Construction contractors would be required to meet federal and state regulations for worker handling of and exposure to hazardous materials. Section 4.9, Hazards and Hazardous Materials, provides additional information regarding worker safety regulations. Given the extensive amount of federal and state regulations, worker exposure at the other project sites would be expected to be less than significant. The potential impacts associated with exposure of workers to hazardous materials with the CDRP in combination with the cumulative projects could be cumulatively significant. The CDRP would be controlled through the implementation of Mitigation Measures 5.9.2a, 5.9.2b, and 5.9.2c in Chapter 5, Mitigation Measures Proposed to Minimize Potentially

Significant Adverse Impacts of the Project, which would ensure that exposure to hazardous materials at the CDRP site would be reduced to a less-than-significant level. With implementation of these mitigation measures, residual contributions of the CDRP to potential cumulative impacts from exposure to hazardous materials would not be cumulatively considerable.

The CDRP could contribute to cumulative impacts associated with the release of NOA and metals during construction and the release of hazardous building materials from the demolition of existing structures. Potential impacts related to accidental releases of hazardous materials would be site-specific and not additive. If releases were to occur at other project locations, they would be expected to affect only nearby soils. Compliance with hazardous materials regulations, including preparation or updating of hazardous materials business plans, would ensure that site-specific impacts are less than significant. Since these impacts are site-specific and there are no other projects in the vicinity of the CDRP site, there would be no cumulative impacts related to the accidental release or exposure to hazardous materials during construction or operation of the cumulative projects.

As discussed in Section 4.9, Hazards and Hazardous Materials, construction activities associated with the CDRP could increase the risk of wildfires during project construction. Overlap of cumulative project construction activity in high fire hazard areas could have the potential to result in a significant cumulative impact related to an increase in wildfire risk. However, the CDRP and other SFPUC projects within the SFPUC's watershed are subject to requirements of the SFPUC's Alameda Watershed Management Plan that are designed to control activities that could increase fire risks, and SFPUC projects and all other area projects are required under California Public Resources Code provisions to control activities during construction that could ignite wildfires. Consequently, each project is expected to have a less-than-significant impact and the collective residual effects on wildfire risk from construction activities in the area of the CDRP would not result in a significant cumulative impact. Therefore the CDRP's contribution to increased wildfire hazard would be less than significant.

6.2.3.8 Cultural Resources

The geographic scope of cumulative impacts on cultural resources includes the CDRP Cultural Resources Study Area (see Figure 4.10.1 in Section 4.10, Cultural Resources) and the Sunol Valley region.

The CDRP would not affect historic resources on or immediately adjacent to the CDRP so it would not contribute to a cumulative impact on historic resources. However, a number of significant archaeological and paleontological resources on or immediately adjacent to the CDRP project site have been identified.

As described in Section 4.10, the construction and/or operation of the CDRP could have a significant adverse impact on archaeological resources and paleontological resources. Cumulative projects, including the Alameda Siphon No. 4, SVWTP, SABPL, and SMP-30 Cemex Quarry Expansion projects, could also encounter previously undiscovered archaeological and paleontological resources and human remains during construction. Thus, cumulative impacts on these resources could be potentially significant and the proposed project's contribution could be cumulatively considerable.

The CDRP includes several mitigation measures to address potential impacts on cultural resources (see Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project). Mitigation Measure 5.10.1 requires, among other things, that the recommendations of a qualified archaeologist be followed when known archaeological resources are subject to ground-disturbing construction activities. Recommendations may include evaluation, preservation in place, archaeological test excavation, and/or archaeological data recovery. With implementation of Mitigation Measure 5.10.1, the CDRP's contribution to cumulative impacts on known archaeological resources would be less than significant.

In the event of accidental discovery of unknown archaeological resources during excavation/construction activities, Mitigation Measure 5.10.2 requires the immediate suspension of work followed by an evaluation of the find by an archaeological consultant, preservation in place, archaeological test excavation, and/or archaeological data recovery. With implementation of Mitigation Measure 5.10.2, the CDRP's contribution to cumulative impacts on unknown archaeological resources would be less than significant.

There are no known paleontological resources in the construction area, but such resources could be encountered. Mitigation Measures 5.10.3, 5.10.4, and 5.10.5 require pre-construction training, surveys, and surface salvage if any significant paleontological resources are discovered. In the event of accidental discovery of paleontological resources during construction or operation of the CDRP, Mitigation Measure 5.10.6 requires the immediate suspension of work followed by an evaluation of the find by a paleontologist, avoidance (if necessary and feasible), and preparation and implementation of an excavation plan (if avoidance is not feasible). With implementation of Mitigation Measures 5.10.3 through 5.10.6, the CDRP's contribution to cumulative impacts on unknown paleontological resources would be less than significant.

Although the CDRP could contribute to cumulative impacts on cultural resources, implementation of the mitigation measures described above would reduce the project's contributions to a less-than-significant level.

6.2.3.9 Visual Resources

The geographic scope of potential cumulative visual impacts is limited to those areas of the Alameda Creek watershed where public views of the Calaveras Dam and Reservoir are available. These areas include parks in the vicinity of the dam and reservoir (Sunol Regional Wilderness Preserve in particular) and segments of county roads in the vicinity of Calaveras Reservoir, such as the Calaveras Road corridor south of Geary Road and Felter Road.

As explained below, the CDRP does not have the potential to contribute to cumulative visual impacts. Most of the anticipated projects identified in Table 6.1 (such as improvements to Highway 84) are outside of the geographic scope of potential visual impacts of the CDRP. Visual changes resulting from other anticipated projects (such as the Hanson Quarries and SMP-30 Cemex Quarry Expansion) would be minimally discernible in views from the portion of Calaveras Road near Calaveras Reservoir or from Sunol Regional Wilderness.

A number of SFPUC and other public agency projects (the UACFGP, the WSIP Habitat Reserve Program, the ACWD Alameda Watershed Steelhead Restoration project, and the PG&E Gas Line Crossing project) are intended to benefit terrestrial biological resources, water quality, and fisheries of Alameda Creek. Although most of these projects could generally be assumed to result in localized beneficial visual impacts along Alameda Creek, visual changes resulting from implementation of these projects would be minimally discernible (if visible at all) when viewed from public parks and County roads that also have views of the project site.

Although the CDRP would have some significant and unavoidable visual impacts, these impacts would not contribute to any cumulative impacts. The CDRP, which is at the south end of the Sunol Valley, is physically separated from the other projects. Views of the other projects from various locations in the Sunol Valley would minimally include the CDRP, if it is visible at all, due to its physical separation from the other projects. Consequently, the CDRP would not make a substantial contribution to any cumulative visual impacts.

6.2.3.10 Transportation and Circulation

The geographic scope of potential cumulative impacts related to transportation and circulation includes Calaveras Road between the project site and I-680, the I-680 on- and off-ramps at Calaveras Road, and I-680 in the vicinity of the Calaveras Road crossing.

Past projects, including nursery facilities along Calaveras Road and establishment of recreational park facilities in southern Sunol Valley, account for current traffic conditions along Calaveras Road. I-680 is a major interstate highway and general growth and development with the region has contributed to traffic on this facility.

As described in Section 4.12, Transportation and Circulation, construction of the proposed project would result in a temporary (approximately 4-year) increase in vehicle trips on northbound and southbound Calaveras Road (between the proposed project site and I-680) and on northbound and southbound I-680. Of all the cumulative projects listed in Table 6.1, only those that are accessed by Calaveras Road (including the NIT, SABPL, SVWTP, and Various Pipeline Inspection projects) would have the potential to contribute to a cumulative traffic impact on Calaveras Road. There are no projects currently being developed in the immediate project vicinity. Some potential future projects (i.e., Alameda County Highway 84 Safety Project, Alameda County Highway 84 Expressway, and Zone 7 Water Agency – Stream Management Master Plan Improvements) would not affect or be affected by traffic on Calaveras Road. Nevertheless, these projects are considered in the traffic analysis because they may generate traffic that could contribute to cumulative traffic impacts on I-680.

The Hanson and SMP-30 Cemex quarry operations are existing operations and vehicle trip generation for these facilities was assumed to remain relatively consistent with existing conditions. Potential new vehicle trips associated with the Highway 84 Safety project, the Highway 84 Expressway project, the Alameda Creek Watershed Steelhead Restoration project, the I-680 High Occupancy Vehicle Lane project, and the Zone 7 Water Agency Stream Management Master Plan Improvements project would add minor and/or sporadic vehicle trips to I-680. Trips associated with these other non-SFPUC projects are accounted for in the projected baseline future 2011 traffic conditions.

Estimated vehicle trips on Calaveras Road and I-680 associated with future projects are summarized in Table 6.2 (past and present projects are included in the existing conditions vehicle-trip counts) and further described in the Section 4.12, Transportation and Circulation.

Analysis of future year cumulative conditions was conducted by CHS Consulting Group based on traffic counts on Calaveras Road collected by CHS Consulting Group in March 2006 (CHS Consulting 2009), traffic volume data on I-680 obtained from Caltrans, and output from the Alameda County travel demand forecasting model. Future baseline traffic volumes were developed by adding the prorated difference in volumes from the Alameda County travel forecasting model between the year 2005 and 2010 to the existing traffic volumes. The traffic associated with the various SFPUC projects that would travel on I-680 and Calaveras Road was added to the future baseline traffic volumes. Combined, the SFPUC projects would add up to 525 vehicle trips to Calaveras Road and up to 531 vehicle trips to I-680 during the a.m. and p.m. peak hours. Traffic analysis using the Highway Capacity Manual 2000 methodology indicated that both Calaveras Road and I-680 would continue to operate at an acceptable level of service during the 4-year construction period for the project and that there would be no significant cumulative traffic impacts on Calaveras Road or I-680 (CHS Consulting 2009).

Table 6.2: Cumulative Project Vehicle Trip Generation

SFPUC Project	A.M. and P.M. Peak Hour	
	Calaveras Road	I-680
Calaveras Dam Replacement	109	101
SVWTP Improvements	146	132
New Irvington Tunnel	120	148
San Antonio Backup Pipeline	24	24
Various Pipeline Inspections	10	10
Alameda Siphon No. 4	68	68
San Antonio Pump Station Upgrade	16	16
Subtotal	493	499
Contingency	32	32
Total	525	531
<i>Notes:</i> Assumptions: 1. All workers arrive and depart during the peak hours. 2. Spoils hauling and material deliveries are distributed evenly through a 10-hour workday.		

Source: Data were acquired from SFPUC staff and represent best information available at the time of compilation. A contingency was added as a conservative measure so that if actual vehicle trips varied from the predicted, the analysis would remain valid.

Truck traffic on Calaveras Road associated with the CDRP and the other Sunol Valley cumulative projects could cause incremental wear and tear on the existing Calaveras Road pavement surface, potentially creating a traffic hazard. However, Calaveras Road has been designed and constructed to accommodate a mix of vehicle types, including the heavy trucks associated with the existing aggregate operations. Alameda County Public Works Agency (ACPWA) staff members confirmed that maintenance of this section of Calaveras Road is conducted on an as-needed basis, that no work is currently planned for this section (indicating a current absence of degraded conditions), and that a recent ACPWA site visit found the road in good condition without any major potholes (Manalo 2008). Given the current adequate state of the road, its present use for heavy quarry traffic without any apparent or obvious physical deficiencies, and the proposed amount of construction traffic associated with the cumulative projects, the anticipated cumulative traffic volume would not significantly degrade pavement conditions. If degraded conditions did occur, the ACPWA would repair the conditions so that potential traffic hazards would be avoided. Since acceptable LOS levels and roadway surface conditions would be maintained, the cumulative impact to bicyclists and bicycle use of Calaveras Road would be less than significant.

Although the cumulative impact of the anticipated future projects on the condition of Calaveras Road is expected to be less than significant, the mitigation identified for the CDRP's project-level

impacts on road conditions would further ensure that the proposed project would not have a considerable contribution to any potentially significant cumulative impact on road conditions. Project Mitigation Measure 5.12.4a, presented in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project, requires the SFPUC to repair roads damaged by project construction activities. With the implementation of this mitigation measure, the construction of the CDRP would not have a considerable contribution to any cumulative impact on road conditions.

I-680 was designed and constructed to handle a mix of vehicle types, including heavy trucks. Potential impacts related to deterioration of I-680 related to cumulative traffic volumes are not cumulatively considerable (less than significant).

The cumulative traffic analysis did not identify any cumulatively considerable traffic impacts based on LOS. However, due to the potential for overlapping project schedules in the Sunol Valley region, as well as for construction traffic associated with Calaveras Road as an access route to all project sites, the potential cumulative impact on traffic would be considered potentially significant. The project-specific traffic control plan described in Mitigation Measure 5.12.4a includes provisions that would require coordination of traffic control plans among SFPUC projects. Implementation of this mitigation measure would reduce this cumulative impact to less than significant.

6.2.3.11 Air Quality

For potential cumulative impacts on air quality, all of the projects in Table 6.1 are included in the analysis. For regional criteria pollutants, regional development now and in the next few years is also included, and the geographic scope of effect is the San Francisco Bay Area Air Basin (Basin).

The geographic scope of potential impacts related to climate change is the planet and global greenhouse gas (GHG) emissions past and future are included in the analysis. Past emissions continue to affect climate due to long residence times in the atmosphere and due to the accumulation of GHGs over time.

The air quality in the vicinity of all the project work areas and the Basin has been affected by past and ongoing projects, including mining or quarry operations, urban development, and SFPUC water conveyance and treatment facilities in Sunol Valley. The Basin is in nonattainment of the applicable federal or state ambient air quality standards for ozone and particulate matter of less than 10 or 2.5 microns in diameter (PM₁₀ and PM_{2.5}, respectively). As such, there are significant adverse impacts on air quality in the project area related to existing non-attainment levels of ozone and particulate matter in the Basin.

The majority of the cumulative ozone impact is the result of ozone precursors emitted from on-road vehicles. PM₁₀ and PM_{2.5} emissions sources are primarily combustion engine exhaust emissions, construction and farming activities, entrained road dust, and windblown dust. Locally, no major stationary sources exist in the project area. The major urban area to the west of the project site is the main contributor to regional criteria pollutants. The existing Calaveras Dam and Reservoir are not substantial contributors to regional or local criteria pollutant concentrations because they are part of a primarily gravity water delivery system and the operational sources of emissions (vehicles, maintenance, etc.) are limited.

Construction activities associated with the CDRP and the other projects listed in Table 6.1 would result in short-term increases in PM₁₀, PM_{2.5}, and ozone precursors. Construction activities associated with some of the cumulative projects would contribute additional emissions at the same time, depending on the timing of their construction relative to the CDRP. Therefore, the CDRP construction-related emissions of PM₁₀, PM_{2.5}, and ozone precursors would contribute to significant cumulative air quality impacts related to existing non-attainment levels of ozone and particulate matter in the Basin.

The Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines indicate that if all feasible control measures are implemented, the impacts of a project on air quality from construction-related emissions of criteria pollutants, including ozone precursors and particulate matter, would not be significant. In its preparation of air plans with strategies for achieving or maintaining air quality standards, the BAAQMD has accounted for emissions due to construction activities throughout BAAQMD's jurisdiction and thus cumulative ozone precursor emissions from construction activities would not interfere with the BAAQMD's goal of attaining federal or state air quality standards.

Without mitigation, construction-related emission of PM₁₀, PM_{2.5}, and ozone precursors resulting from the CDRP could contribute considerably to potentially significant cumulative impacts. Application of feasible particulate control measures (Mitigation Measure 5.13.1a, in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project) and construction equipment exhaust control measures (Mitigation Measure 5.13.1b) would reduce project emissions such that the CDRP would not have a cumulatively considerable contribution to cumulative air quality impacts related to existing levels of ozone precursors, PM₁₀, and PM_{2.5} (less than significant).

As discussed in Section 4.13, Air Quality, the BAAQMD is currently in the process of developing new quantitative CEQA significance thresholds for construction-related emissions of ozone precursors and particulate matter (BAAQMD 2009). The BAAQMD expects to adopt these new thresholds of significance later this year. In anticipation of the future implementation of proposed new BAAQMD CEQA thresholds of significance, this Draft EIR provides an analysis of the

project's cumulative construction emissions to determine whether they would exceed the proposed thresholds.

As stated in Section 4.13, Air Quality, construction-related emissions would be below the draft BAAQMD significance thresholds for CO (547 pounds per day [lbs/day]) and SO₂ (219 lbs/day), but could exceed the thresholds for the ozone precursors ROG (54 lbs/day) and NO_x (54 lbs/day), and for PM₁₀ (82 lbs/day), and PM_{2.5} (54 lbs/day). Implementation of the BAAQMD fugitive dust controls identified in Mitigation Measure 5.13.1a, BAAQMD exhaust controls identified in Mitigation Measure 5.13.1b, and the enhanced dust controls for work in areas containing naturally occurring asbestos under Mitigation Measure 5.9.2a would reduce PM₁₀ and PM_{2.5} emissions by at least 75 percent. However, even with these reductions, construction-related emissions of PM₁₀ and PM_{2.5} would likely exceed the draft threshold of significance of 82 lbs/day and 54 lbs/day, respectively.

BAAQMD exhaust controls identified in Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would reduce construction-related emissions of ROG and NO_x by at least 5 percent and 20 percent, respectively. However, even with these reductions, construction-related emissions of ROG and NO_x would likely exceed the draft thresholds of significance of 54 lbs/day. Based on existing and feasible mitigation strategies, the project's worst-case construction-related emissions of ROG, NO_x, PM₁₀, and PM_{2.5} cannot be reduced below the proposed BAAQMD thresholds. In order to be in compliance with proposed BAAQMD thresholds ROG would need to be reduced 35 percent, NO_x 89 percent, PM₁₀ 98.5 percent, and PM_{2.5} 98.2 percent. At this time no feasible mitigation exists that would reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} these percentages and thus, below proposed BAAQMD thresholds. Therefore, construction-related emissions of ozone precursors, PM₁₀, and PM_{2.5} would have a cumulatively considerable contribution to a significant cumulative impact from emissions of ozone precursors and particulate matter in accordance with the proposed BAAQMD thresholds of significance.

As discussed in Section 4.13, Air Quality, climate change is a global impact caused by emissions of greenhouse gases. As presented in Section 4.13, no state or regional air quality agency has adopted a methodology or quantitative threshold that can be applied to evaluate the significance of an individual project's contribution to GHG emissions, such as the ones that exist for criteria pollutants. The GHG impacts of other past, present, and reasonably foreseeable future projects, along with implementation of the proposed project could result in potentially significant cumulative impacts. However, with continuing implementation of GHG reduction actions by the City and County of San Francisco and SFPUC, and additional proposed SFPUC GHG-reduction actions, the project's contributions to cumulative GHG emissions would not conflict with the state goals of reducing GHG emissions to 1990 levels by 2020, as set forth in the California Global Warming Solutions Act of 2006 or the City's own climate action goal as set forth in the Greenhouse Gas Reduction Resolution (see "Greenhouse Gases Emissions, Local and Regional

Provisions” in Subsection 4.13.1.2, Regulatory Framework, in Section 4.13, Air Quality).

Therefore, the project would not contribute considerably to cumulative greenhouse gas emissions.

In anticipation of the future implementation of proposed new BAAQMD CEQA thresholds of significance for GHG emissions, this Draft EIR provides an analysis of the project’s cumulative construction emissions to determine whether they would exceed the proposed thresholds.

As stated in Section 4.13, Air Quality, construction-related GHG emissions would not be likely to exceed the total construction GHG emissions threshold (35,250 metric tons [MT] carbon dioxide equivalent [CO₂e]) under proposed GHG Threshold Option 1; however, the project would be likely to exceed the daily threshold (10 MT/day CO₂e) under proposed GHG Threshold Option 2. Implementation of the BAAQMD exhaust controls identified in Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would reduce project related GHG emissions. The exact reduction percentage cannot be calculated at this time, and even with these reductions, construction-related emissions of GHG would likely still exceed the draft daily threshold of significance of 10 MT/day CO₂e. No other feasible mitigation exists that would reduce construction-related emissions of GHG to below the BAAQMD draft daily threshold of significance. Therefore, construction-related emissions of GHG would contribute considerably to cumulative greenhouse gas emissions under the proposed BAAQMD GHG thresholds of significance Option 2.

Potential exists for cumulative impacts associated with diesel particulate matter (DPM) emissions. Based on regional studies and analysis, it has been determined that existing (current background) excess cancer risk associated with DPM in the Bay Area and the project vicinity ranges from approximately 100 to 500 in a million (CARB 2008), meaning that 100 to 500 new cases of cancer are projected to occur in a population of 1 million people who are exposed to ambient levels of DPM over a 70-year lifetime.

The California Air Resources Board (CARB) identified particulate emissions from diesel-fueled engines as a toxic air contaminant (TAC) in August 1998 and formed the Diesel Advisory Committee consisting of staff from CARB, the U.S. Environmental Protection Agency, state and local agencies, industry, environmental groups, and interested public to study this issue. With the help of the committee, CARB has adopted a Diesel Risk Reduction Plan to reduce particulate matter emissions from diesel-fueled engines and vehicles. The Diesel Risk Reduction Plan calls for reducing DPM emissions 75 percent by 2010 and 85 percent by 2020 from the 2000 level. The Diesel Risk Reduction Plan outlines strategies to reduce diesel particulate matter emissions through cleaner fuels, such as ultra low sulfur diesel, new diesel tailpipe regulations, and regulations governing operations such as idling restrictions. The project would implement the following applicable Diesel Risk Reduction Plan strategies:

- The use of low-sulfur fuel (as required by current regulations);
- Replacement of fossil-fueled equipment with electrically driven equivalents where feasible;
- A preventive maintenance and inspection program for diesel-fueled equipment; and
- Idling restrictions.

The CDRP would incorporate many of the strategies presented in the Diesel Risk Reduction Plan (either by project design or mitigation measures) and would be in conformance with this plan. In addition, the operation phase of the project would generate virtually no DPM emission.

Therefore, the CDRP would not include any activities or elements that would prevent the BAAQMD's or CARB's successful implementation of programs to reduce DPM emissions.

The CDRP could contribute to a localized cumulative DPM impact during the construction phase, as project design and mitigation measures will reduce but not entirely eliminate DPM emissions and several related projects in Sunol Valley would also contribute to DPM impacts (Irvington Tunnel, Calaveras Dam Replacement, Alameda Siphons, San Antonio Back-up Pipeline, Hanson Quarry, and Cemex Quarry).

The BAAQMD is currently working on new guidelines for the analysis of cumulative DPM impacts. At the time of preparation of this Draft EIR the BAAQMD had not issued a recommended methodology or an emissions threshold for evaluation of potential cumulative DPM impacts. However, the BAAQMD has established a greater than 10 in 1 million excess cancer risk from TACs as the threshold for new stationary sources that require a permit to operate, such as power plants, oil refineries, and asphalt plants. Facilities that exceed this threshold are required to implement Best Available Control Technology for Toxics (BACT). Since the BAAQMD does not evaluate cumulative risk for such facilities (i.e., the additive risk of permitting several plants with overlapping air quality impacts), the greater than 10 in a million excess cancer risk is essentially a threshold above which individual stationary source facility's TAC emissions would be considered cumulatively considerable.

For the purposes of this analysis, the project-level DPM threshold of more than 10 excess cancers per 1 million people (based on numerical modeling of emissions sources) was also applied as a cumulative threshold. Based on a preliminary screening analysis, unmitigated construction-related diesel PM emissions could exceed the significance threshold for excess cancer risk for various populations (including residents and offsite workers) in the general vicinity of the project. To reduce diesel PM emissions during project construction, Mitigation Measure 5.13.1b requires scheduled tune-ups of construction vehicles and equipment to maintain low emissions and limits idling of all non-commuting diesel vehicles and equipment to a maximum of five minutes.⁵ Mitigation Measure 5.13.3a requires all off-road diesel construction equipment to be equipped

⁵ It is assumed that worker commuting vehicles (of which less than 1 percent are diesel-fueled) have negligible idling.

with USEPA Tier 2 engines and CARB Level 3 (greater than or equal to 85 percent abatement efficiency) Diesel Emission Control Strategies. Mitigation Measure 5.13.3b requires use of 2004 model year or newer engines for haul trucks limited to onsite routes.

To determine whether Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would be adequate to reduce the cancer and non-cancer risks associated with project-related diesel PM emissions to below the significance thresholds identified above, a Health Risk Screening Analysis (HRSA) was prepared. The HRSA quantifies the human health risk due to exposure to project-generated diesel PM with the mitigation measures in place. The complete results of the analysis are provided in *Data Report for Health Risk Screening Analysis of Diesel Particulate Emissions Associated with Calaveras Dam Replacement Project, Alameda and Santa Clara Counties, California* (ENVIRON 2009). As summarized in Table 4.13-6 in Section 4.13 “Air Quality,” the results of the HRSA indicate that with the implementation of Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b the potential excess cancer risk from diesel PM emissions at the MEI for the various populations evaluated would be less than the significance threshold of greater than 10 in 1 million for cancer risk and that the non-cancer risk would be less than the threshold of Hazard Index 1 (ENVIRON 2009). Therefore, project-generated construction-related TAC emissions would not contribute considerably to the cumulative condition.

Project operations would not result in an increase in long-term emissions of TACs because operation- and maintenance-related activities would be unchanged compared with those under existing conditions. Following construction of the replacement dam, the office, vehicle maintenance, and other structures that would be built to accommodate contractor and personnel during project construction would be removed. The number of personnel serving on-site during construction would be reduced to the small number currently operating and maintaining the facilities. As noted in Impact 4.13.3 of Section 4.13, Air Quality, sensitive receptors also are located at sufficient distances from the project site to prevent exposures. As a result, there would be no long-term contribution to the cumulative condition.

Rock types known to contain NOA are mapped within the Calaveras Fault zone and on the western side of Observation Hill as well as beneath the Calaveras Creek channel downstream of the existing dam, at the right abutment of the existing dam, in the hillside to the east of the dam, and at a source of the fill, construction-related activities (e.g., ground disturbance) could result in the airborne entrainment of NOA. The issues related to the generation of airborne particulate matter that potentially contains NOA and naturally occurring metals are presented in Section 4.9, Hazards and Hazardous Materials.

6.2.3.12 Noise and Vibration

The geographic scope of cumulative impacts on noise includes the residential sensitive receptors located off of Calaveras Road, Marsh Road, and Felter Road in the vicinity of the construction sites and haul routes, including the watershed keeper's residence near Calaveras Road.

Noise impacts associated with the CDRP would be related to construction and hauling activities, as operation of the replacement dam would not involve any new noise-generating equipment or other noisy activities. It is not expected that on-site construction activities related to other projects listed in Table 6.1 would be audible to sensitive receptors located near the CDRP construction areas, as none of the projects in Table 6.1 are located adjacent to the CDRP site. Therefore, the CDRP would not contribute to significant cumulative noise impacts due to construction at project sites.

During construction of the CDRP, vehicles (including trucks) would use Calaveras Road between the proposed work areas and I-680. This construction-related vehicle noise could contribute to increased vehicle noise associated with other planned projects within the Sunol Valley, including the NIT, Alameda Siphon No. 4, SVWTP, SABPL, and Various Pipeline Inspection projects. The cumulative traffic analysis (described above under "Transportation and Circulation") indicates that as many as 525 vehicles per hour (peak hour) could travel along Calaveras Road under the worst-case scenario. Based on the noise analysis conducted for this Draft EIR, the noise levels from cumulative traffic on Calaveras Road would be less than 70 A-weighted decibels, steady-state energy level (dBA L_{eq}) during the daytime at both the ranch residence (Receptor D located approximately 2,000 feet west of Calaveras Road) and the watershed keeper's residence (Receptor H located approximately 225 feet east of Calaveras Road). Therefore, no cumulative noise impact would result from traffic along Calaveras Road during the daytime.

The CDRP, combined with other cumulative projects in Sunol Valley, could result in nighttime noise impacts associated with traffic on Calaveras Road. The proposed project would include a night shift, and therefore worker passenger vehicles and construction vehicles could use Calaveras Road at night.

The noise analysis indicates that cumulative nighttime traffic on Calaveras Road could generate up to 52 dBA L_{eq} at the ranch residential receptor (if peak hour traffic of approximately 525 vehicles per hour were to occur at night and all the vehicles were trucks), which would not exceed the 53-dBA nighttime ordinance noise limit but would exceed the 50-dBA sleep interference threshold. The nighttime noise level at the watershed keeper's residence near Calaveras Road would exceed the nighttime noise threshold of 50 dBA L_{eq} . Noise modeling indicates that up to 4 trucks and 100 worker vehicles per hour could use Calaveras Road and not exceed the 50 dBA L_{eq} threshold at the watershed keeper's residence. However, since this

residence is located upslope of Calaveras Road and topographic characteristics will likely reduce traffic noise by at least 5 dBA, up to the CDRP's total of approximately 60 vehicles and 30 trucks per hour could use Calaveras Road at night without exceeding the nighttime 50-dBA sleep interference threshold. Since the project alone could generate 83 vehicles and 26 trucks per hour on Calaveras Road during the nighttime hours, the project could make a considerable contribution to this cumulative impact. Implementation of traffic controls that limit nighttime truck operations to maintain noise levels at 50 dBA (L_{eq}) at the closest receptors (see Mitigation Measure 5.17.1 in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project) would reduce the project's contribution to this cumulative impact (less than significant).

Noise on I-680 from CDRP traffic in combination with cumulative project traffic is not expected to significantly alter existing noise levels. High ambient noise levels typically occur along these types of roadways and the additional traffic from the cumulative projects would not substantially raise existing freeway noise levels.

6.2.3.13 Utilities, Service Systems, and Public Services

The geographic scope of cumulative impacts on public services and utilities encompasses the Alameda Creek watershed and the Sunol Valley region.

The construction of the CDRP could result in an increased demand for fire protection services and with other SFPUC projects and public and private projects in the Sunol Valley region could contribute to a cumulative increase in the demand for fire protection services. Compliance with California Public Resources Code provisions governing the use of construction equipment in fire-prone areas and the fire presuppression requirements of the *Alameda Watershed Management Plan* is required for all foreseeable SFPUC projects in the watershed and would help to minimize the potential for ignition at various project sites through the Sunol Valley region. However, if construction of cumulative development occurred over the same time frame and within the same high fire hazard areas, a cumulative increase in the demand for fire protection services may result. As described in Impact 4.15.1 in Section 4.15, Utilities, Service Systems, and Public Services, the introduction of potential new fire ignition sources could temporarily increase the demand for fire protection during the 4-year construction period of the CDRP. Since this increase in demand for fire protection services would be temporary in nature, neither additional fire protection personnel nor new fire protection facilities such as fire stations would be needed. Compliance with California Public Resources Code provisions governing the use of construction equipment in fire-prone areas and compliance with the fire presuppression requirements of the *Alameda Watershed Management Plan* would ensure that the CDRP's incremental contribution to any cumulative impacts on the response capabilities of local fire protection agencies would be less than significant. Implementation of traffic control plans that provide for emergency vehicle access

would ensure that cumulative impacts on the response capabilities of local law enforcement agencies would be less than significant.

Solid waste disposal from the CDRP and proposed projects listed in Table 6.1 would most likely be served by the Vasco Road and Altamont Landfills. As described in Impact 4.15.3, the CDRP's demand on the Altamont and Vasco Road landfills would be negligible. Over the 4-year construction period, the proposed project would generate up to 800 cubic yards of solid waste for off-site disposal, and 100 percent of this waste would be reused, recycled, or disposed of on-site. Therefore, the CDRP's contribution to cumulative construction-related demand on regional landfill capacity would not be cumulatively considerable, and the CDRP project impact on cumulative landfill capacity would be less than significant.

The CDRP and cumulative development in the Sunol Valley region could disrupt utility services or require temporary or permanent relocation of utilities. Potential impacts would be site-specific rather than additive and would be mitigated on a site-specific basis. As described under Impact 4.15.4, the utility lines that serve Calaveras Dam do not serve residential or commercial land uses. As part of project design, the utility lines that serve the dam would be relocated before construction activities begin to ensure uninterrupted service to the dam. Therefore, the CDRP would not result in cumulative impacts on existing public utilities.

The CDRP and projects listed in Table 6.1 would not result in substantial new development of residential or commercial land uses. The operation of the new replacement dam and other foreseeable industrial projects, such as quarry expansion, in the Sunol Valley region would not generate a substantial increased demand for police protection, or emergency medical services and would not increase demand on schools, parks, or other services such that there would be a direct need for new or expanded infrastructure. Therefore, the CDRP would not incrementally add to a regional demand that would result in the need to construct additional government facilities to meet that demand. The number of workers and worker family members that may relocate to the area that could require services is negligible relative to the population and existing supporting infrastructure. Any workers and worker family members who temporarily relocate to the area associated with the cumulative projects would be readily accommodated by existing service providers. The south Bay Area has a population of nearly 2 million people with supporting services in place. Even if the cumulative projects drew 5,000 workers and worker family members to the area, this number would represent an increase of less than one-half of 1 percent in the population. Therefore, the cumulative impacts on public services related to expanded infrastructure would be less than significant.

6.2.3.14 Mineral and Energy Resources

The geographic scope of cumulative impacts on mineral and energy resources would be southern Alameda and northern Santa Clara counties and the Bay Area region.

As described in Section 4.16, Mineral and Energy Resources, there are substantial quantities of rock, clay, and aggregate (sand and gravel) resources in the vicinity of the CDRP site. According to the California Department of Conservation, approximately 458 million tons of aggregate resources are available in the San Francisco South Bay region (California Department of Conservation 2006).

Construction of the CDRP would result in increased demand for mineral and energy resources. The project would require large amounts of rock, clay, and aggregate resources. Most of the materials needed for construction of the replacement dam would come from SFPUC property surrounding the dam and reservoir. The volume of off-site materials needed for the CDRP (approximately 0.1 percent of the available aggregate resources) would not result in the loss of availability of an important or scarce mineral resource. Construction of the other anticipated projects listed in Table 6.1 would generally require smaller amounts of mineral resources. Operation of the CDRP and other anticipated projects would have no continuing demand for mineral resources. Therefore, the CDRP's contribution to cumulative demand for mineral resources would not be significant.

The CDRP construction would involve use of substantial energy to fuel construction vehicles and equipment. Some of the projects described in Table 6.1 would use a substantial amount of energy during the construction and/or operation period (e.g., the SMP-30 Cemex Quarry Expansion, Hanson Quarries, and SVWTP projects). However, implementation of exhaust control measures (performing low-emissions tune-ups as specified in Mitigation Measure 5.13.1b, in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project) would ensure that fuels are not used in a wasteful or inefficient manner. During construction, the proposed project's contribution to the potential cumulative impact associated with wasteful energy use is not considered cumulatively considerable because fossil fuels would not be used in a wasteful manner, as discussed in Section 4.16. Additionally, the contractors associated with the cumulative projects listed in Table 6.1 would be economically motivated not to be wasteful because wastefulness would reduce project profitability. Therefore, the region-wide cumulative increase in construction-related energy consumption would not be cumulatively significant. The proposed project in conjunction with the cumulative projects would not substantially increase energy use during operation because they would involve a minimal increase in energy use during operations and would not be energy-intensive. Therefore, there would be no significant cumulative impact related to wasteful energy use during project operation.

6.3 SIGNIFICANT ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED IF THE PROPOSED PROJECT IS IMPLEMENTED

In accordance with Section 21067 of CEQA and with Sections 15126(b) and 15126.2(b) of the *CEQA Guidelines*, the purpose of this section is to identify significant environmental impacts that could not be eliminated or reduced to less-than-significant levels by implementation of mitigation

measures included in the proposed project or identified in Chapter 5, Mitigation Measures Proposed to Minimize Potentially Significant Adverse Impacts of the Project.

The proposed project, with mitigation, would have significant, unavoidable impacts on visual resources, nighttime noise, construction-related transportation, and air quality.

During construction, the construction site would be visible from the Sunol Regional Wilderness. Viewers would perceive high levels of activity and movement and the visual disruption of work in progress, and the visual clutter and disorder of stored equipment and materials. These visual intrusions could impair the enjoyment of views from some portions of the park for the duration of construction. Screening devices would be ineffective as mitigation. Therefore this impact would be significant and unavoidable.

Excavation of the peak of Observation Hill and Hill 1000 (for the spillway) and Borrow Area B (for construction materials) would permanently alter the profiles of these features when viewed from the Sunol Wilderness. Construction activities for the replacement dam would result in a large area of site disturbance in the vicinity of the replacement dam from the removal of the existing cover of oak woodland vegetation. Excavation and grading taking place, particularly in Borrow Area B, near the proposed dam and to the north of the proposed dam would alter the existing topography and increase the visual discontinuity of the dam complex with the irregular and sloped natural landforms in the vicinity. These actions would have substantial adverse effects on views of the project area. Implementation of policies of the *Alameda Watershed Management Plan*, calling for site and vegetation restoration would occur as part of the proposed project. In addition, revegetation and site restoration required under Mitigation Measures 5.4.2 and 5.7.1 would reduce the visual impacts of the project related to site disturbance during construction. These efforts would lessen the impact on scenic views from the Sunol Regional Wilderness. Although many areas would be revegetated, they would still take decades to recover; restoration of oak woodland habitat would not be feasible in Borrow Area B, on Observation Hill, or on Hill 1000. Because the mitigation measures would not reduce visual impacts to less-than-significant levels for several decades, this impact would therefore be considered significant and unavoidable.

Construction activities would occur during hours beyond the time limits specified in the Alameda County and Santa Clara County noise ordinances. Construction activities occurring beyond the ordinance time limits would not, for the most part, exceed ordinance noise limits at the closest residential receptors near Borrow Area E/Staging Area 11. However, it is possible that back-up beepers could exceed the Santa Clara County Noise Ordinance nighttime limit of 55 dBA for no more than 5 minutes in any given hour at these receptors if multiple pieces of equipment are in use at the same time. This could cause sleep disturbance at the closest receptors located approximately 3,000 feet away (particularly if windows are open). Implementation of a noise

monitoring program and noise controls (Mitigation Measure 5.14.1) would reduce significant construction noise impacts to a less-than-significant level most of the time. However, even with this program, back-up beepers could still exceed ordinance limits during the nighttime hours. Therefore, this impact would be considered significant and unavoidable.

Construction-related traffic on Calaveras Road would have a significant traffic safety impact on motorists, bicyclists, and pedestrians. Implementation of a Traffic Control Plan in accordance with Mitigation Measure 5.12.4a and temporary closure of a portion of Calaveras Road under Mitigation Measure 5.12.4b would reduce this impact to a less-than-significant level. However, if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site, implementation of Mitigation Measure 5.12.4b would not be feasible. Therefore, the impact of the CDRP on traffic safety hazards during project construction is potentially significant and unavoidable.

BAAQMD exhaust controls identified in Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would reduce the CDRP's construction-related emissions of ozone precursors and particulate matter to less-than-significant levels based on existing BAAQMD thresholds of significance. However, existing and feasible mitigation strategies would not reduce emissions of ozone precursors and particulate matter below the proposed BAAQMD thresholds. Similarly, implementing Mitigation Measures 5.13.1b, 5.13.3a, and 5.13.3b would reduce the CDRP's construction-related GHG emissions, but likely not below the proposed BAAQMD GHG threshold of significance Option 2. Therefore, these project-specific impacts would be considered significant and unavoidable.

Based on existing BAAQMD thresholds of significance, the CDRP would not contribute considerably to cumulative air quality impacts related to emissions of ozone precursors and particulate matter. However, using proposed BAAQMD thresholds, construction emissions from the CDRP would have a cumulatively considerable contribution to a significant cumulative impact from emissions of ozone precursors and particulate matter that would be significant and unavoidable. Similarly, construction-related emissions of GHG would contribute considerably to cumulative GHG emissions under the proposed BAAQMD GHG threshold of significance Option 2.

The proposed project is one of several improvement projects that make up the SFPUC WSIP. Insofar as the proposed project is a component of the WSIP, it would contribute to the WSIP's unavoidable water supply and growth-inducement impact, as follows: indirect growth-inducement impacts in the SFPUC service area.

These impacts were adequately addressed in the PEIR at a sufficient level of detail such that no further analysis is required in this EIR. The analysis contained in the PEIR is incorporated into this Draft EIR by this reference. Since completion of the PEIR, analyses of hydrology in

Alameda Creek prepared for the CDRP EIR has shown that streamflow impacts would be less than significant.

6.4 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

In accordance with Section 21100(b)(2)(B) of CEQA and with Sections 15126(c) and 15126.2(c) of the CEQA Guidelines, the purpose of this section is to identify significant irreversible environmental changes that would be caused by the proposed project.

Construction of the proposed project would be an irretrievable commitment of resources, such as concrete and steel, to be used for the construction of the replacement dam, outlet works, and ancillary structures. The use of these materials is an irretrievable commitment of resources.

Implementation of the proposed project would also result in the irreversible commitment of energy resources to fuel and maintain construction equipment (such as gasoline, diesel, and oil). This commitment would end upon construction completion.

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7. ALTERNATIVES TO THE PROPOSED PROJECT

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This chapter begins with an overview of the alternatives to the proposed project and a summary comparison of their impacts. The seven alternatives evaluated in the Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR) are then summarized. The next part of the chapter discusses alternatives to the proposed project and their impacts and identifies the environmentally superior alternative. The chapter concludes with a discussion of the alternatives to the proposed project that were considered and rejected.

7.1 OVERVIEW

7.1.1 CEQA REQUIREMENTS

California Environmental Quality Act (CEQA) Guidelines (State CEQA Guidelines) Section 15126.6 requires that an Environmental Impact Report (EIR) describe a reasonable range of alternatives to the proposed project that could feasibly attain most of the basic project objectives (as identified in Chapter 3, Project Description) and would reduce one or more significant impacts caused by the proposed project (as identified in Chapter 4, Environmental Setting and Impacts).

The State CEQA Guidelines further state that an EIR need not consider every conceivable alternative to the project. The range of alternatives should be selected in such a way as to foster meaningful dialogue, informed decision making, and public participation. In addition, a “no project” alternative must be considered. An EIR is not required to consider alternatives that are infeasible. The feasibility of an alternative may be determined based on a variety of factors, such as site suitability, economic viability, consistency with applicable plans and regulatory limitations, and whether the project sponsor can reasonably acquire, control, or obtain access to an alternative site (if the sponsor already owns the alternative site) (State CEQA Guidelines, Section 15126.6[f][1]). The final determination of feasibility of the alternatives analyzed in the EIR will be made by the San Francisco Public Utilities Commission (SFPUC) in its deliberations on the proposed project.

7.1.2 ALTERNATIVES CONSIDERED

A range of alternatives that could feasibly meet most of the basic project objectives but that would avoid or substantially lessen any of the significant effects of the project as proposed was identified as part of the development of the proposed project.

This chapter presents six alternatives, including the No Project Alternative, that were selected from 10 alternatives initially considered for detailed analysis and comparison with the project. The remaining four alternatives that were considered but eliminated from further analysis are described briefly below and presented in detail in Section 7.10. The six alternatives evaluated were selected for detailed analysis after all 10 alternatives were screened against the objectives of the project, the ability to lessen significant effects of the project, and feasibility. The four

alternatives considered but rejected for detailed analysis did not meet most of the project objectives, resulted in additional significant impacts relative to the project, were not feasible, or were similar to one of the six alternatives selected for detailed analysis and therefore did not add to the reasonable range of alternatives to be considered in detail.

The project objectives are listed in Chapter 3, Project Description. As described in Chapter 3, the primary objectives of the Calaveras Dam Replacement Project (CDRP) are as follows:

- Re-establish water delivery reliability;
- Restore water supply and the capacity of the reservoir to its pre-2001 restriction level of 96,850 acre-feet (AF) using water from the Alameda Creek watershed, thereby restoring 7 million gallons per day (mgd) of water supply during the 8.5-year design drought (the SFPUC's drought planning scenario);
- Improve seismic reliability through construction of a replacement dam designed to safely retain 96,850 AF of water and withstand the maximum credible earthquake (7.25 moment magnitude) on the Calaveras Fault; and
- Construct a new dam with a robust design (wide centrally located clay core, wide filters, and internal drainage) that could accommodate potential enlargement by future generations.

The secondary objectives of the proposed project are as follows:

- Continue reservoir and outlet works operation, to the extent possible, during construction; and
- Maintain high water quality, re-creating a deeper pool that would keep water temperatures cooler to limit algal growth in the reservoir.

The objective of constructing a new dam with a robust design that could accommodate potential enlargement by future generations is included so that the dam would be designed and constructed so as not to preclude potential future enlargement. The design would allow for potential future reuse of dam components without the requirement of extensive dam removal or rebuilding. The SFPUC does not reasonably foresee the need for a larger dam beyond one that restores the reservoir's capacity to pre-DSOD restricted levels and a larger dam and reservoir is not included in the proposed project. Potential future dam enlargement is not proposed at this time and is not included in this EIR.

Because the basic objectives of the project are to restore the water storage capacity of the existing Calaveras Reservoir and to improve the seismic safety of the existing dam, the development of suitable alternatives is more constrained than for projects involving the construction of new facilities. Thus, the range of potential alternatives includes alternatives for components of the proposed project (e.g., earth and rockfill materials sources and disposal), and their construction. These potential alternatives were evaluated for their feasibility and their ability to reduce one or more significant impacts caused by implementing the proposed project. No complete feasible alternative to the project that would lessen environmental impacts, such as another location for

the proposed replacement dam, could be identified as part of the alternatives evaluation process described above.

The following alternatives to the project are evaluated in this chapter:

- **Alternative 1, No Project Alternative:** The No Project Alternative would not replace the existing seismically deficient dam, but it would include modifications to the existing dam's spillway to comply with the California Department of Water Resources, Division of Safety of Dams (DSOD) directive to the SFPUC to address safety issues.
- **Alternative 2, Off-Site Disposal Alternative:** Alternative 2 would be the same as the proposed project, except that disposal of excess unusable earth and rockfill materials would occur entirely off site rather than at the on-site disposal locations identified for the proposed project. This alternative is proposed to reduce or eliminate significant environmental impacts on wetlands and waters of the U.S., habitat of sensitive plant and animal species, and other biological resources at Disposal Sites 3 and 7.
- **Alternative 3, Off-Site Borrow Alternative:** Alternative 3 would be the same as the proposed project, except for its use of off-site locations for borrow materials. Rockfill and clay for dam construction would not be obtained from the two on-site borrow areas identified for the proposed project. This alternative is proposed to reduce or eliminate significant environmental impacts related to biological, cultural, and visual resources and noise associated with Borrow Areas B and E.
- **Alternative 4, Consolidated On-Site Disposal Alternative:** Alternative 4 would be the same as the proposed project, except for its elimination of Disposal Site 7, one of four proposed disposal sites adjacent to Calaveras Reservoir. Under Alternative 4, spoils would be disposed of in Disposal Site 5 rather than Disposal Site 7. This alternative is proposed to reduce or eliminate significant environmental impacts on vegetation and wildlife at Disposal Site 7.
- **Alternative 5, New Downstream Dam without Provision for Potential Future Enlargement Alternative:** Alternative 5 would construct a replacement dam with a thinner core and narrower crest than the proposed project, and so would not accommodate future enlargement. This alternative would require 11 percent less dam construction material than the proposed project, thereby reducing the excavation at Borrow Area E and disposal at Disposal Site 3. Alternative 5 is proposed to reduce air quality, transportation, noise, and cultural resources impacts from the movement of materials and impacts on water quality, fisheries, and aquatic resources from sediment discharge and erosion.
- **Alternative 6, Replacement Dam at Existing Location Alternative:** Alternative 6 would reuse the existing dam's footprint and spillway alignment rather than construct a replacement dam immediately downstream. The rebuilt dam would have a thinner core and narrower crest than the proposed project, and so would not accommodate potential future enlargement. Under this alternative, spoils would be disposed in Disposal Site 5 rather than Disposal Site 2. This alternative is proposed to reduce impacts on wetlands and aquatic habitat downstream of the existing dam. Alternative 6 is also proposed to avoid excavation into Observation Hill and Hill 1000, potentially reducing significant and unavoidable impacts related to visual resources and noise.

The following alternatives were considered and rejected from further consideration:

- Alternative Locations for Water Storage
 - Alternative Locations for Water Storage in the SFPUC's Upper Tuolumne River System or in Non-SFPUC Bay Area Facilities
 - Alternative Locations for Water Storage in SFPUC Facilities in the Bay Area
 - Alternative Water Storage Facilities in the Sunol Valley Area
- Larger Dam and Reservoir Alternative

These alternatives, and the reasons for their rejection, are discussed in Section 7.10, Alternatives Considered and Rejected, at the end of this chapter.

7.1.3 SUMMARY COMPARISON OF ALTERNATIVES

The environmental impacts of the alternatives were evaluated using the same significance criteria identified for evaluation of the proposed project. The discussion below focuses mainly on potentially significant adverse effects, with emphasis on differences between the impacts of the alternatives and those of the proposed project. Table 7.1 describes each alternative, the impacts it is intended to reduce, and its ability to meet project objectives. Table 7.2 compares the impacts associated with each alternative to the impacts of the proposed project by resource area. In Table 7.2, the descriptors "increased," "decreased," and "similar" refer to the overall magnitude of the impacts for a resource area relative to the proposed project and do not necessarily indicate a change in a particular impact conclusion.

7.2 WSIP ALTERNATIVES

The WSIP PEIR evaluated seven alternatives to the WSIP, summarized below, because of their apparent ability to meet most of the WSIP's goals, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative was included as required by CEQA. The adopted WSIP incorporated elements of three alternatives to the originally proposed WSIP: the No Purchase Request Increase Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative (see SFPUC Resolution 08-0200). PEIR Chapters 9 and 14 included more detailed descriptions of these WSIP alternatives, and also presented the associated program-level environmental analysis; PEIR Chapter 13 included additional information about the adopted WSIP. All three of these chapters are incorporated into this EIR by reference. For informational purposes, the alternatives examined in the PEIR are also summarized below.

Table 7.1: Alternatives Selected for CEQA Analysis

Alternative/Description	How does this alternative differ from the proposed project?	What proposed project impacts does this alternative intend to reduce?	What is the alternative's ability to meet project objectives?
Alternative 1: No Project Alternative			
The No Project Alternative would not replace the existing seismically deficient dam, but it would include modifications to the existing dam's spillway to comply with California Department of Water Resources, Division of Safety of Dams (DSOD) safety requirements. The maximum water level would be permanently reduced to the elevation that currently occurs under DSOD restrictions.	The No Project Alternative would have shorter-duration and smaller-scale construction. Although the alternative would result in a substantially greater excavation on Observation Hill to lower the spillway, overall excavation would be reduced relative to the proposed project.	Included as required by CEQA.	The No Project Alternative would not meet any of the project objectives due to the permanent limitations on reservoir storage.
Alternative 2: Off-Site Disposal Alternative			
Under the Off-Site Disposal Alternative, disposal of excess unusable earth and rockfill materials would occur entirely off site rather than at the on-site disposal locations identified for the proposed project.	Alternative 2 would not disturb on-site Disposal Sites 3 or 7, although Site 5 would still be disturbed by excavation at Borrow Area E. Staging areas would be larger to accommodate temporary stockpiles of spoils. Truck trips would increase substantially to transport spoils to off-site disposal areas. The duration of construction would increase by approximately 4 years to a total of 8 years due to increased hauling.	Impacts associated with the on-site disposal areas, including impacts on vegetation and wildlife, sensitive species and wetlands; aquatic habitat; and visual resources at Disposal Sites 3 and 7.	Alternative 2 would meet all of the project objectives.

Table 7.1: (Continued)

Alternative/Description	How does this alternative differ from the proposed project?	What proposed project impacts does this alternative intend to reduce?	What is the alternative's ability to meet project objectives?
Alternative 3: Off-Site Borrow Alternative			
Under the Off-Site Borrow Alternative, rockfill and clay for dam construction would be obtained from off-site locations rather than the two on-site borrow locations identified for the proposed project.	Alternative 3 would not disturb Borrow Areas B and E. Truck trips would substantially increase to transport dam construction materials from off-site locations up to 40 miles away. The duration of construction would increase by approximately 2 years to a total of 6 years due to increased hauling.	Impacts associated with on-site borrow, including vegetation and wildlife, visual, noise, and cultural resource impacts associated with excavation and movement of materials from Borrow Areas B and E.	Alternative 3 would meet all of the project objectives.
Alternative 4: Consolidated On-Site Disposal Alternative			
The Consolidated On-Site Disposal Alternative would use Disposal Site 5, a 60-acre site at the southern end of the reservoir. This alternative would eliminate use of Disposal Site 7, a 17-acre site on the east side of the reservoir.	Alternative 4 would use Disposal Site 5, reserved for surplus rock and soil under the project. Disposal Site 5 would also be a borrow area, and therefore temporary stockpiling would be necessary while the area is excavated. Hauling distances to the southern end of the reservoir would be longer than the distances to Disposal Site 7.	Impacts associated with Disposal Site 7, including impacts on vegetation and wildlife and visual resources.	Alternative 4 would meet all of the project objectives.

Table 7.1: (Continued)

Alternative/Description	How does this alternative differ from the proposed project?	What proposed project impacts does this alternative intend to reduce?	What is the alternative's ability to meet project objectives?
Alternative 5: New Downstream Dam without Provision for Potential Future Enlargement Alternative			
Alternative 5 would construct a replacement dam with a thinner core and narrower crest that would not accommodate potential future enlargement.	While the dam footprint would be the same as under the project, Alternative 5 would reduce the amount of materials needed for construction by about 11 percent. As a result, excavation from Borrow Area E would not be as deep as under the project, and less material would be disposed of at Disposal Site 3. The construction period would be about 4 months shorter than the construction period for the project.	Impacts associated with borrow and disposal including air quality, transportation, noise, water quality, fisheries, and cultural resources.	Alternative 5 would meet all project objectives except the objective to construct a new dam with a robust design that could accommodate potential enlargement by future generations.
Alternative 6: Replacement Dam at Existing Location Alternative			
Alternative 6 would construct a replacement dam within the existing dam's footprint (rather than downstream) and reuse the existing spillway alignment.	Alternative 6 would require construction of a cofferdam immediately upstream of the existing dam. Dredging, underwater construction, and pile driving would be required. Reuse of the existing spillway would avoid a cut slope on Observation Hill and Hill 1000. The duration of the project would be increased by one to a total of 5 years due to construction of the cofferdam in the reservoir and the reservoir would need to be drawn down during construction.	Impacts associated with a new downstream dam, including impacts on wetlands and aquatic habitat. Impacts on visual resources associated with excavation into Observation Hill and Hill 1000. Impacts on noise and cultural resources from the movement of material.	Alternative 6 would not meet two project objectives: It would not allow continued operation of the reservoir and outlet works during construction and it would not be feasible to construct a new dam at the location of the existing dam with a robust design that could accommodate potential enlargement by future generations. It would only partially meet the secondary objective related to water quality, as the alternative would cause significant water quality degradation due to reservoir drawdown during construction.

Table 7.2: Comparison of Proposed Project Impacts to Alternatives Selected for CEQA Analysis

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal Alternative	Alternative 3 Off-Site Borrow Alternative	Alternative 4 Consolidated On- Site Disposal Alternative	Alternative 5 No Provision for Future Dam Enlargement Alternative	Alternative 6 Replacement Dam at Existing Location Alternative
4.3 Land Use, Agricultural Resources, and Recreation						
Land use and agricultural resources impacts would be less than significant. The project is in an undeveloped area without sensitive receptors, and it would not change surrounding land uses. Any reduction in land available for grazing would be minor and temporary. Impacts of construction activities on recreation would be less than significant with mitigation. Restrictions, closures, visual changes, and congestion at recreation facilities would be temporary. Alternate access and bicycle routes and mitigation to coordinate with AMGEN Tour organizers would reduce impacts from temporary road closures to less than significant levels, and any road damage would be repaired.	Decreased Impacts on land use, agricultural resources, and recreation would be decreased compared to the proposed project. The shorter duration and smaller scale of construction would result in less disruption of recreation and grazing activities during construction.	Increased Land use and agricultural impacts would be similar to those of the proposed project, with less disruption of grazing activities during construction. Impacts on recreation would be increased due to the substantial increase in truck trips on Calaveras Road and the 4 additional years of construction activities relative to the proposed project but would remain less than significant with mitigation.	Increased Land use and agricultural impacts would be similar to those of the proposed project, with less disruption of grazing activities during construction. Impacts on recreation would be increased due to the significant increases in truck trips on Calaveras Road and the 2 additional years of construction activities relative to the proposed project but would remain less than significant with mitigation.	Similar Land use impacts would be similar to those of the proposed project. This alternative would result in less disruption of grazing activities during construction. Impacts on recreation would be marginally increased due to the slightly longer construction duration (6 months).	Similar Land use impacts would be similar to those of the proposed project. The slightly shorter construction duration (4 months less) would result in less disruption of recreation and grazing activities. Like the proposed project, the alternative would not significantly affect agricultural land uses.	Similar Land use impacts would be similar to those of the proposed project. This alternative would result in less disruption of grazing activities during construction; like the proposed project, the alternative would not significantly affect agricultural land uses. Although the duration of construction is longer, the first year of construction would not involve much traffic on roadways that would affect recreational access.

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On- Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
4.4 Vegetation and Wildlife						
Impacts on wetlands/aquatic habitats would be less than significant with mitigation during construction and reservoir filling. Project design, restoration, and compensation would minimize habitat loss from fill, disturbance, and pollutant discharge. Implementation of flow releases would reduce impacts to less-than-significant levels during operations.	Decreased Construction impacts on wetland and wildlife habitat would substantially decrease. No new impacts would occur, and the amount of habitat disturbed and restoration needed to mitigate habitat impacts would be reduced. Borrow areas and the west haul route would not be necessary, and disposal would only occur at one disposal site (3 or 7). The overall impact on annual grassland habitat would be less than the impact under the proposed project, although excavation into Observation Hill would cause greater local disturbance. Inundation impacts would be eliminated. This alternative would not change reservoir operations from the baseline.	Decreased Impacts on sensitive species associated with the disposal sites would be reduced or eliminated. Dam construction, borrow area excavation, and Alameda Creek Diversion Dam (ACDD) bypass facility construction and operations would have the same impacts as the proposed project. The duration of construction impacts would be increased.	Decreased Impacts on sensitive species associated with the borrow areas, west haul route, and Disposal Site 5 would be reduced or eliminated. Dam construction, disposal of surplus materials, and ACDD bypass facility construction and operations would have the same impacts as the proposed project. The duration of construction impacts would be increased.	Decreased Impacts on sensitive species associated with Disposal Site 7 would be eliminated. Temporary stockpiling of disposal material adjacent to Disposal Site 5 would result in new or increased impacts on vegetation and wildlife at this site. Dam construction, borrow area excavation, and ACDD bypass facility construction and operations would have the same impacts as the proposed project.	Similar The area of habitat disturbance for construction would be the same despite excavation and disposal of less material. This alternative would therefore have impacts similar to those of the project.	Increased Although reusing the existing dam site would reduce the loss of riparian habitat downstream, drawdown of the reservoir during construction could reduce food supply, aquatic/wetland habitat, water quality, and access, increasing impacts on wildlife during construction. Eliminating the new dam footprint and inundation area would reduce less than significant long-term impacts from loss of wetland/aquatic habitat.
Impacts on special-status species/sensitive communities from construction and filling would vary. Impacts would be less than significant for species/communities not expected within the project area and less than significant with mitigation for those present, due to habitat loss/degradation and mortality. Pre-construction surveys, avoidance, relocation, monitoring, and compensation would reduce impacts. During operations, continued mitigation would be required for foothill yellow-legged frog; impacts on all other species would be less than significant.						

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
The project would not conflict with local policies or ordinances protecting biological resources.						
4.5 Fisheries and Aquatic Habitat						
Impacts on fisheries resources in the reservoir and upstream would be beneficial due to improved water quality and habitat conditions. The project would have no impact on fish barriers or conflicts with local plans. Impacts on fisheries resources downstream and in the extended study area would be less than significant due to fish relocation activities and rainbow trout adaptive management, overall improved habitat, and minimal changes to flows. Impacts from temporary water quality degradation would be less than significant with mitigation. Implementation of Best Management Practices (BMPs) and the Storm Water Pollution Prevention Plan (SWPPP) would minimize localized impacts on fish.	Similar Water quality degradation that could adversely affect fisheries would decrease due to smaller-scale construction, thereby decreasing impacts on fisheries. Like the project, mitigation would reduce impacts to less than significant. Operations would maintain baseline conditions resulting in no change to fisheries resources (this may have long-term adverse effects for fisheries in the reservoir). Beneficial effects of the proposed project would not occur.	Decreased Water quality degradation that could adversely affect fisheries would decrease due to reduced ground disturbance and direct contact of the reservoir with disposed material, thereby decreasing construction impacts on fisheries. Operations impacts would be the same as those identified for the proposed project.	Decreased Water quality degradation that could adversely affect fisheries would decrease due to reduced ground disturbance, thereby decreasing construction impacts on fisheries. Operations impacts would be the same as those identified for the proposed project.	Similar Ground disturbance would be reduced at Disposal Site 7, but increased at Disposal Site 5. Inundation effects would be similar to the proposed project. Disposal Site 5 (Borrow Area E) would be inundated under both this alternative and the no project. Operations impacts would be the same as those identified for the proposed project.	Similar Water quality degradation during construction that could adversely affect fisheries would be similar, although excavation and disposal of material would be slightly reduced. Operations impacts would be the same as for the proposed project.	Increased Drawdown of the reservoir could eliminate resident fisheries and increase temperature, resulting in a significant and unavoidable impact. Noise and vibration, water quality degradation, and limited connectivity to Arroyo Hondo for migratory fish from installing the coffer dam would increase construction impacts. Bypassing flows may benefit downstream fisheries in the short term, but the longer time required to re-fill the reservoir would delay establishment of a cold-water pool. Operations impacts once the reservoir is refilled would be the same as under the proposed project.

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
4.6 Hydrology						
Construction and operations impacts would all be less than significant. Any changes to downstream flows during construction would be within the range of past operations. Flooding risks and effects on groundwater supply during construction would be minimal/temporary. Operational effects on flows, channel formation, and sedimentation in Alameda and Calaveras Creeks would be within the range of pre-project conditions. The risk of flooding would decrease, and effects on groundwater would be minimal.	Decreased Construction and operations would have fewer impacts on hydrology as compared to the project because the alternative would maintain baseline conditions, resulting in no changes to hydrology.	Similar Construction-related hydrology impacts would not be appreciably changed due to the change in location of disposal. Operations would be the same as under the proposed project, and thus hydrology effects would be the same.	Similar Construction-related hydrology impacts would not be appreciably changed due to the change in the source of borrow material. Operations would be the same as under the proposed project, and thus hydrology effects would be the same.	Similar Construction-related hydrology impacts would not be appreciably changed due to the shift in use of disposal sites. Operations would be the same as under the proposed project, and thus hydrology effects would be the same.	Similar The reduction in construction and disposal materials would have a negligible effect on construction-related impacts relative to the proposed project. Operations would be the same as under the proposed project, and thus hydrology effects would be the same.	Similar This alternative would have different impacts during construction and refill than the proposed project because it would involve drawdown of the reservoir, full bypassing of flows during construction, and longer time to refill after construction is complete. The increase in flow rates in Calaveras and Alameda Creeks downstream of Calaveras Dam from bypassed flows is expected to be within the historical range of conditions, with less than significant impacts. Operations would be the same as under the proposed project, and thus long-term hydrology effects would be the same.

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
4.7 Water Quality						
Construction impacts related to erosion, contaminants, solid waste, and groundwater supplies would be less than significant with mitigation. Site-specific BMPs and appropriate management of drilling fluids would avoid/minimize water quality impacts. Operational impacts would be beneficial for the reservoir because the project would improve water quality conditions, particularly temperature conditions. Impacts on Alameda and Calaveras Creeks would be less than significant because water quality would not substantially change over the long term.	Decreased Construction-related water quality impacts associated with the project would be reduced due to the smaller scale and shorter duration of construction. However, construction-related impacts would remain less than significant with mitigation due to excavation of Observation Hill and use of Disposal Site 3 or 7. Operations would maintain baseline conditions, requiring continued use of the hypolimnetic oxygenation system. Maintaining the current reservoir elevation would not increase the cold-water pool volume and consequently would not provide a water quality benefit compared to the proposed project.	Decreased Construction impacts from erosion and sediment discharge at on-site disposal sites would be eliminated and decreased overall due to less ground disturbance. However, the duration of construction impacts would be substantially increased. Operational effects on water quality would be the same as those identified for the proposed project.	Decreased Construction impacts from erosion and sediment discharge at on-site borrow sites and the west haul route would be eliminated and decreased overall due to less ground disturbance. Potential contact with borrow materials containing naturally occurring asbestos (NOA), metals, or contaminants used in construction would be substantially reduced. The duration of construction impacts would be substantially increased. Operational effects on water quality would be the same as those identified for the proposed project.	Increased Temporary stockpiling and additional handling of disposal material could increase impacts from erosion and sediment discharge during construction. Elimination of Disposal Site 7 would reduce the need for site stabilization and run-off management. Operational effects on water quality would be the same as those identified for the proposed project.	Similar Construction impacts from erosion and sediment discharge would be marginally reduced due to excavation of less borrow material, but the overall magnitude of material handled would be similar. Operational effects on water quality would be the same as those identified for the proposed project.	Increased Construction of the cofferdam and drawdown of the reservoir would substantially increase impacts on water quality in the reservoir and downstream due to increased sediment discharge, exposure to contaminants, and increased water temperatures during construction. Operational effects on water quality would be the same as those identified for the proposed project.

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
4.8 Geology, Soils, and Seismicity						
Impacts related to landslides, seismic hazards/activity, expansive/corrosive soils, and alteration of topography/geology would be less than significant due to project design and compliance with standard practices.	Similar The large excavation of Observation Hill would extend the risk of slope failure and hazardous rock fall over a longer duration. Impacts related to severe erosion, slope instability, and seismic loading would be avoided with the use of only one Disposal Site (3 or 7).	Decreased Impacts related to erosion, seismic loading, and ground failure at on-site disposal sites would be eliminated.	Decreased Impacts would be reduced compared to the proposed project. There would be no excavation for on-site borrow, eliminating erosion and slope instability hazards in these areas. There would also be less material requiring on-site disposal.	Similar Impacts would be similar to the proposed project. Use of Disposal Site 5, which may not occur under the proposed project, would require a geotechnical evaluation and mitigation to reduce any impacts to less than significant, similar to the proposed project.	Similar The reduction in construction and disposal materials would not appreciably change impacts relative to the proposed project.	Similar The slight increase in excavation and disposal of material would have similar impacts as the proposed project. Use of Disposal Site 5 instead of Disposal Site 2 may require mounding spoils above grade, but impacts could be mitigated, as with the proposed project.
Impacts related to erosion/slope stability, seismic loading, and seismically induced ground failure would be less than significant with mitigation. Site-specific geotechnical evaluations, the SWPPP, and post-construction activities would reduce geology, soils, and seismicity impacts.						
4.9 Hazards and Hazardous Materials						
Impacts related to the release of hazardous materials, airborne naturally occurring asbestos NOA, metals and fuel would be less than significant with mitigation. Compliance with the San Francisco Bay Regional Water Quality Control Board, Bay Area Air Quality Management District (BAAQMD), California Division of Occupational Safety	Decreased Impacts would be reduced due to the reduction in disturbance of NOA-bearing soils. Borrow areas would not be necessary, and the large excavation of Observation Hill would not likely produce NOA-laden soils.	Similar Impacts would be similar to the proposed project because excavation, hauling activities and use of Disposal Site 2 could still release NOA despite disposal at off-site at waste facilities. Impacts associated with borrow sites would	Decreased Impacts related to excavating NOA-bearing materials would be reduced by importing fill from off-site locations and eliminating on-site borrow areas; blasting at Borrow Area B would not occur.	Similar Impacts would be similar to those of the proposed project due to the similar types of construction activities and amounts of material being disturbed. Double handling of NOA-containing materials could increase potential impacts on	Similar The reduction in construction and disposal materials would not appreciably change impacts relative to the proposed project.	Similar Impacts related to releases of NOA would be similar to those of the proposed project because approximately the same amount of NOA-containing materials would be disturbed. Excavation would be slightly greater at Borrow Area

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On- Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
and Health, and SFPUC requirements and implementation of management/contingency plans would reduce impacts. Impacts related to the risk of explosion, wildfire, and groundwater contamination would be less than significant due to compliance with state/local requirements and safety measures.		remain the same.		construction workers and recreational users. This impact could be mitigated to less than significant.		B, but the new spillway site would not be disturbed.
4.10 Cultural Resources						
The project would have no impact on historic architectural resources because none in the study area are eligible for inclusion in the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR). Construction-related impacts on known/unknown archeological resources and unknown paleontological resources would be less than significant with mitigation. Impacts of restoration of reservoir water levels on known archeological resources would be less than significant with mitigation and on unknown	Decreased Borrow areas and dam excavation would not be necessary, eliminating effects on cultural resources in these areas. The larger excavation of Observation Hill would increase the potential to encounter unknown cultural resources at that site, but the impact would remain less than significant with mitigation. Overall impacts would be reduced compared to the proposed project.	Decreased Ground disturbance at on-site disposal sites would be eliminated, decreasing the potential impact on buried cultural resources. Impacts associated with ground disturbance of borrow site would remain the same.	Decreased Ground disturbance at on-site borrow sites would be eliminated, decreasing the potential impact on buried cultural resources.	Similar Impacts would be similar to those of the proposed project, although slightly reduced because ground disturbance at Disposal Site 7 would be eliminated.	Similar The amount of material excavated from Borrow Area E would decrease by about 11%, which could slightly change the depth of excavation and therefore slightly decrease the potential for impacts to buried cultural resources. Overall impacts of the alternative would be similar to the proposed project.	Similar The amount of material excavated from Borrow Area E would decrease by about 6%, which could slightly change the depth of excavation and therefore slightly decrease the potential for impacts to buried cultural resources. The potential for impacts to buried cultural resources at downstream dam site would be eliminated, while a potential impact would be introduced at the new coffer dam site. Overall impacts of the alternative would be

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
palaeontological resources would be less than significant. Documentation and investigations by a qualified archaeologist and suspension of construction for accidental discovery would identify and preserve the information potential of cultural resources.						similar to the proposed project.
4.11 Visual Resources						
Excavation of the peak of Observation Hill (for the spillway), Hill 1000 for construction of a new stilling basin, and Borrow Area B for construction materials would permanently alter the view from Sunol Wilderness, causing a significant and unavoidable impact. Construction activities would have a temporary significant and unavoidable impact on views from Sunol Wilderness. Impacts on views from county roads and impacts from nighttime lighting would be less than significant due to road closures and obscured views. Impacts from operations would be less than significant due to a comparable replacement dam and restored water level.	Similar Smaller-scale and shorter-duration construction would decrease the temporary construction-related visual impacts, but the significant and unavoidable impact would remain. Excavation of Hill 1000 and Borrow Area B would not occur, but a significant and unavoidable permanent visual impact would still occur due to the larger excavation into Observation Hill.	Similar This alternative would not eliminate or substantially reduce the significant and unavoidable permanent impact on views from Sunol Wilderness due to excavations at Observation Hill and Hill 1000. By eliminating on-site disposal sites, this alternative would reduce some visual impacts. However, the duration of construction impacts would be increased by approximately 4 years, and the significant and unavoidable temporary impact would remain.	Similar This alternative would not eliminate or substantially reduce the significant and unavoidable permanent impact on views from Sunol Wilderness due to excavations at Observation Hill and Hill 1000. Due to the elimination of borrow sites, this alternative would result in reduced construction impacts. However, the duration of construction impacts would be increased by approximately 2 years, and the significant and unavoidable temporary impact would remain.	Similar This alternative would result in the same significant and unavoidable permanent impact on views from Sunol Wilderness due to excavations at Borrow Area B, Observation Hill, and Hill 1000. The significant and unavoidable temporary impact would occur from construction activities, including stockpiling of disposal materials. Less than significant temporary visual impacts would be reduced by avoiding disturbance of Disposal Site 7.	Similar This alternative would result in the same significant and unavoidable permanent impact on views from Sunol Wilderness due to excavations at Borrow Area B, Observation Hill, and Hill 1000. The significant and unavoidable temporary impact would occur from construction activities. The areas of disturbance at borrow and disposal areas would be the same, and the reduced volume of material would not change visual impacts.	Decreased The significant and unavoidable permanent impact on views from Sunol Wilderness would be reduced because excavation at Observation Hill and Hill 1000 would not be needed, but would remain due to the slightly larger excavation of Borrow Area B. Temporary visual impacts from other construction activities would be similar to those of the proposed project, and the significant and unavoidable temporary impact would remain.

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
4.12 Transportation and Circulation						
Impacts on traffic and emergency access would be less than significant, because the increase in vehicle trips would be minimal and limited to the project area. Impacts on roadway capacity, and wear and tear would be less than significant with mitigation. A Traffic Control Plan would minimize any delays/hazards and require repair of any roadway damage. Impacts on traffic safety would be significant and unavoidable if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site.	Decreased The volume of truck trips would be reduced. Construction activities would require closure of Calaveras Road between Geary Road and the dam, and the potentially significant and unavoidable impact to traffic safety would still occur. Construction would be smaller-scale and 2 years shorter in duration.	Increased Transportation of disposal materials to remote off-site locations would substantially increase truck trips and extend the duration of construction by 4 years. This would increase wear and tear, delays, and traffic safety hazards on Calaveras Road and potentially increase the significant and unavoidable impact to traffic safety.	Increased Transportation of borrow materials from off-site locations would substantially increase truck trips and extend the duration of construction by 2 years. This would increase traffic impacts and wear and tear, delays, and traffic safety hazards on Calaveras Road and potentially increase the significant and unavoidable impact to traffic safety.	Similar Impacts would be similar to those of the proposed project. On-site truck traffic on the west haul route would increase, but this would not affect traffic safety on Calaveras Road. Construction activities would require closure of Calaveras Road between Geary Road and the dam, and the potentially significant and unavoidable impact to traffic safety would still occur.	Similar Impacts would be similar to those of the proposed project. The excavation, disposal, and importation of less material would decrease on-site and off-site truck trips, but would not substantially change impacts compared to the proposed project. The potentially significant and unavoidable impact to traffic safety would still occur.	Similar On-site hauling would be increased due to the longer construction duration (1 year), but this would not change transportation impacts. The alternative would require slightly more imported filter and drain material from off-site locations, increasing truck trips, but would not substantially change impacts compared to the proposed project. The potentially significant and unavoidable impact to traffic safety would still occur.
4.13 Air Quality						
Impacts related to greenhouse gas (GHG) and long-term Clean Air Plan (CAP)/precursor emissions, odors, and air quality plans would be less than significant. Construction activities would be temporary. Short-term increases in CAP/precursor, and diesel	Decreased Fewer truck trips for spoils disposal and the elimination of borrow areas would substantially decrease air emissions. However, emissions	Increased More truck trips for off-site spoils disposal would substantially increase air emissions. Emissions would likely exceed BAAQMD draft significance thresholds,	Increased More truck trips to transport off-site borrow materials would substantially increase air emissions. Emissions would likely exceed BAAQMD draft	Increased Longer hauling distances to Disposal Site 5, stockpiling, and additional handling of the disposal materials would increase air emissions.	Decreased Fewer truck trips for excavation and disposal of less material would decrease air emissions. However, emissions would likely exceed BAAQMD draft	Increased The increase in truck trips and the construction period by 1 year would increase air emissions. Emissions would likely exceed BAAQMD draft

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
particulate matter (PM) emissions would be less than significant with mitigation. BAAQMD dust/exhaust control measures would limit emissions from construction activities. Operations would be similar to existing conditions, resulting in no long term impacts on air quality. Emissions may exceed BAAQMD draft significance thresholds even with mitigation, resulting in a significant and unavoidable impact.	would likely exceed BAAQMD draft significance thresholds, resulting in a significant and unavoidable impact, like the proposed project.	resulting in a significant and unavoidable impact, like the proposed project.	significance thresholds, resulting in a significant and unavoidable impact, like the proposed project.	Emissions would likely exceed BAAQMD draft significance thresholds, resulting in a significant and unavoidable impact, like the proposed project.	significance thresholds, resulting in a significant and unavoidable impact, like the proposed project.	significance thresholds, resulting in a significant and unavoidable impact, like the proposed project.
4.14 Noise and Vibration						
Nighttime construction-related noise would have a significant and unavoidable temporary impact. Noise controls would reduce noise to local ordinance levels, but nearby residences may experience disturbances. Impacts from construction-related vibration and long-term noise would be less than significant. Controlled blasting/pile driving would be below vibration thresholds, and operations would not exceed ambient noise levels. Disturbance from blasting	Decreased Borrow Area E and Disposal Site 5 would not be used, eliminating associated noise impacts, including the significant and unavoidable nighttime impact from back-up beepers. Construction noise impacts, including impacts related to blasting, would still occur and be less than significant with mitigation.	Similar Noise at disposal sites would be reduced or eliminated. Noise would increase on local roads and regional highways from the increased truck trips to off-site disposal areas but, like the proposed project, could be mitigated. The duration of construction would be 4 years longer than under the proposed project. The significant and unavoidable	Decreased The significant and unavoidable noise impact associated with nighttime activities at Borrow Area E would be eliminated. Blasting at Borrow Area E would be eliminated, reducing less than significant impacts near the southern end of the reservoir. Noise would increase on local roads and regional highways from the	Increased Impacts would be increased compared to the proposed project. Noise impacts would be shifted from the vicinity of Disposal Site 7 to Disposal Site 5. The significant and unavoidable nighttime impact due to back-up beepers at Borrow Area E would remain and increase in duration by 6 months. Disturbances related to	Similar The 4 month shorter construction duration due to excavation and disposal of less material would marginally reduce construction noise impacts, including at Borrow Area E. The significant and unavoidable nighttime impact due to back-up beepers at Borrow Area E would remain. Disturbances related to long-term operations	Similar Temporary construction-related noise and vibration in the area surrounding the dam would remain essentially the same as described for the proposed project. Noise disturbance at Borrow Area E would be slightly reduced, but the significant and unavoidable nighttime impact due to back-up beepers would remain. Noise disturbance at

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
during construction would be less than significant with mitigation. Noise controls and reduction in blasting charges/frequency would minimize noise.	Disturbances related to long-term operations would remain less than significant.	nighttime impact due to back-up beepers at Borrow Area E would remain. Disturbances related to long-term operations would remain less than significant.	increased truck trips to off-site borrow areas but could be mitigated. The duration of construction would be 2 years longer than under the proposed project. Disturbances related to long-term operations would remain less than significant.	long-term operations would remain less than significant.	would remain less than significant.	Disposal Site 5 could be increased. Disturbances related to long-term operations would remain less than significant.
4.15 Utilities, Service Systems, and Public Services						
Utilities, service systems, and public services impacts would be less than significant. The project would not increase the demand for fire/police protection, schools, parks, or other services.	Similar Impacts would be similar to those of the proposed project, although less intense due to the smaller scale and shorter duration of construction.	Increased The increase in truck trips to off-site disposal locations would increase the risk of traffic safety incidents, potentially requiring greater emergency response resources.	Increased The increase in truck trips to off-site borrow locations would increase the risk of traffic safety incidents, potentially requiring greater emergency response resources.	Similar Impacts would be similar to those of the proposed project due to the similar nature of construction.	Similar Impacts would be similar to those of the proposed project due to the similar nature of project construction.	Similar The 1-year increase in construction duration and slight differences in construction activities and locations would not appreciably change impacts.
4.16 Mineral and Energy Resources						
The impact of using of rock, clay, and sand during construction would be less than significant because the project would not compromise the availability of mineral resources. The temporary increase in energy use during construction would be less than significant	Decreased Impacts on mineral resources would be reduced because commercial sources of sand and gravel for dam construction would not be needed. The smaller scale and	Increased Impacts on mineral resources would be the same as those of the proposed project because the alternative would use the same source of materials as the proposed project	Increased Impacts on mineral resources would be increased compared to the proposed project because the alternative would use off-site commercial sources for borrow materials.	Increased Impacts on mineral resources would be the same as those of the proposed project because the alternative would use the same source of materials as the proposed project.	Decreased Impacts on mineral resources would be reduced because the less robust dam design would require less imported materials for construction. The decrease in truck	Increased Impacts on mineral resources would be slightly reduced due to decreased material requirements for the replacement dam. The overall increase in truck trips and 1 year

Table 7.2: (Continued)

Proposed Project	Alternative 1 No Project Alternative	Alternative 2 Off-Site Disposal	Alternative 3 Off-Site Borrow	Alternative 4 Consolidated On-Site Disposal	Alternative 5 No Provision for Future Dam Enlargement	Alternative 6 Replacement Dam at Existing Location
with mitigation. Exhaust control measures would minimize inefficient/wasteful use of fuel. Energy use for operation of the reservoir is very low and would not substantially increase with project implementation, resulting in no impact on minerals and energy resources.	shorter duration of construction would reduce fuel consumption. Operations would be unchanged from baseline and have no impact on energy resources.	The increase in truck trips to off-site disposal locations would substantially increase fuel consumption. Operations would be the same as under the proposed project and would have no impact on energy resources.	The increase in truck trips to off-site borrow locations would substantially increase fuel consumption. Operations would be the same as under the proposed project and would have no impact on energy resources.	Double handling of disposal materials and longer hauling distances would increase fuel consumption. Operations would be the same as under the proposed project and would have no impact on energy resources.	trips for less construction material would reduce fuel. Operations would be the same as under the proposed project and would have no impact on energy resources.	increase in construction period would increase fuel consumption. Operations would be the same as under the proposed project and would have no impact on energy resources.
<i>Notes:</i> Increased – indicates that overall magnitude of impacts in a particular resource area is increased relative to the proposed project. Similar – indicates that the overall types and magnitude of impacts in a particular resource area are similar to the proposed project. Decreased – indicates that the overall magnitude of impacts in a particular resource area is reduced relative to the proposed project. <i>Source:</i> Data compiled by EDAW in 2009						

7.2.1 NO PROGRAM ALTERNATIVE

Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies, thus meeting only the water quality goals of the WSIP. It would endeavor to meet increasing customer purchase requests through the year 2030 by diverting additional Tuolumne River water only when available under existing City and County of San Francisco (CCSF) water rights.

7.2.2 NO PURCHASE REQUEST INCREASE ALTERNATIVE

The No Purchase Request Increase Alternative is designed to serve wholesale customers only the amount of water required under the existing Master Water Sales Agreement between the CCSF and each of the wholesale customers.

7.2.3 AGGRESSIVE CONSERVATION/WATER RECYCLING AND LOCAL GROUNDWATER ALTERNATIVE

Under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects but would endeavor to serve the projected increase in customer purchase requests through 2030 only through additional conservation, water recycling, and local groundwater projects.

7.2.4 LOWER TUOLUMNE RIVER DIVERSION ALTERNATIVE

Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin River. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional water system.

7.2.5 YEAR-ROUND DESALINATION AT OCEANSIDE ALTERNATIVE

Under the Year-Round Desalination at Oceanside Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would construct a 25-mgd desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030.

7.2.6 REGIONAL DESALINATION FOR DROUGHT ALTERNATIVE

Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects and would partner with other Bay Area water

agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years.

7.2.7 MODIFIED WSIP ALTERNATIVE

Under the Modified WSIP Alternative, the SFPUC would implement all of the proposed WSIP facility improvement projects but would modify proposed system operations to minimize environmental effects. This alternative would include the implementation of key mitigation measures identified in the PEIR.

7.3 ALTERNATIVE 1, NO PROJECT ALTERNATIVE

7.3.1 DESCRIPTION OF THE ALTERNATIVE

The No Project Alternative is defined as no action being taken to replace the existing seismically deficient dam. Under the No Project Alternative, the SFPUC would not strengthen the existing dam or replace the existing dam with a new one. The dam would remain in place in its current form. The spillway would be lowered to comply with DSOD safety requirements. For this alternative it is assumed that the DSOD would not require removal of the dam, further actions to stabilize the dam structure in the event of an earthquake, or complete draining of the reservoir.

Safety issues related to the existing dam would be addressed by permanently lowering the reservoir water level to an elevation that would prevent uncontrolled releases of impounded water in the event of a major earthquake. The DSOD has stated that for the No Project Alternative, it would require the SFPUC to determine a permanent water surface elevation in the reservoir that would prevent an uncontrolled release of impounded water in the event of the design earthquake (Gutierrez, pers. com. 2005). The DSOD would then conduct an independent analysis to verify that the permanent surface water elevation constitutes a permanent safe storage of water. The DSOD further indicated that the spillway elevation would need to be lowered.

For the purposes of this analysis it is assumed that, under the No Project Alternative, the reservoir maximum water level would be reduced permanently to the elevation that currently occurs under DSOD restrictions (Elevation 705 feet) and maintained at that level. Under the No Project Alternative, either the spillway crest of the existing dam would need to be lowered from Elevation 756 feet to the new permanent reservoir level at Elevation 705 feet and the spillway chute lowered accordingly, or a new spillway tunnel would need to be constructed through rock in the left abutment to provide the appropriate capacity to maintain the reservoir in addition to the capacity of the existing outlet works. The tunnel option is not favored by the DSOD due to issues with long-term maintenance of the tunnel. Therefore, this option is not evaluated further in this assessment.

Because of the required lowering of the spillway, several other modifications to the dam would be needed. Upstream of the spillway crest structure, an approach channel with an elevation of approximately 700 feet would be excavated. Abutment slopes would be excavated on both sides of the spillway. To establish the lowered spillway, a substantially larger cut into Observation Hill would be needed than that for the proposed project. The cut could require as much as approximately 500,000 cubic yards of excavation into Observation Hill (URS 2007). This excavated material would be disposed of in Disposal Site 3 or 7 (see Table 7.3).¹ Access to Disposal Site 3 or 7 would be the same as for the proposed project.

New, 20- to 35-foot-high concrete sidewalls would be constructed for much of the upper portion of the spillway chute. A new spillway bridge would be constructed, which in turn would necessitate a new access road to connect to existing access roads. Since there would be no excavation at Borrow Area E for the No Project Alternative, the west haul route adjacent to the reservoir would not be constructed under this alternative.

Table 7.3: Estimated Disposal Quantities for the Proposed Project and Alternative 1 (No Project)

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 1 (No Project) ¹
Disposal Site 2	470,000	Not used
Disposal Site 3	2,250,000	500,000 ²
Disposal Site 5	Reserve disposal area	Not used
Disposal Site 7	1,060,000	500,000 ²
Total	3,780,000	500,000
<i>Notes:</i> ¹ Quantities for Alternative 1 are approximate. ² Spoils would be disposed of in either Disposal Site 3 or 7.		

Source: URS 2007

The overall construction period for the No Project Alternative would be approximately 2 years. Since the No Project Alternative would merely stabilize the existing dam with no associated water supply benefit, it is assumed that there would be less urgency regarding its implementation. Therefore, a typical daytime construction schedule is assumed rather than the 24-hour schedule for the proposed project.

Operation of Calaveras Dam under the No Project Alternative would approximate that of the existing baseline condition under the restricted reservoir water level. The Alameda Creek Diversion Dam (ACDD) would be operated on a limited basis depending on flow conditions. Under the No Project Alternative, it is assumed that operation of the ACDD would continue as

¹ Excavation spoils could also be disposed of off-site. This option is discussed in Alternative 2 and is not pursued further for the No Project Alternative.

during the CEQA baseline period. Calaveras Dam would continue to primarily impound water from Arroyo Hondo and Calaveras Creek. In most normal or above-normal water years, that combined flow would be passed through the outlet works relatively quickly—either directed to the Sunol Valley Water Treatment Plant (SVWTP) or released through the cone valve—to maintain the restricted water level. Calaveras Reservoir would function primarily as a holding or regulating facility. Under the No Project Alternative, the operating volume of the reservoir would not be restored to its approximate historical levels as under the proposed project. Assuming DSOD concurrence, storage could remain at about 38,100 AF.

Under the No Project Alternative, the 1997 Memorandum of Understanding (MOU) flow agreement would need to be substantially modified. The water temperature criteria specified in the MOU likely could not be met during most summers due to the lack of cold-water storage, although it might be possible to meet some of the MOU flow requirements. For this reason, it is assumed that summer releases downstream of the Calaveras Dam would not occur under the No Project Alternative.

7.3.2 ABILITY TO MEET PROJECT OBJECTIVES

Because of the permanent limitation on reservoir size, the water quality, water supply reliability, and emergency supply benefits of the proposed project would not be realized under the No Project Alternative. None of the primary project objectives would be fully met by the No Project Alternative. Because the No Project Alternative would permanently reduce the reservoir's elevation, the alternative would not meet the primary project objective of restoring the reservoir's water supply and capacity to pre-2001 levels in order to provide 7 mgd of drought water supply. As a result of the permanently lowered reservoir level, the No Project Alternative also would not re-establish water delivery reliability nor allow for potential future enlargement. Although seismic safety would be provided by permanently lowering of the reservoir water level and spillway, the seismic safety objective of the proposed project would not be fully met as this project objective is to provide a seismically safe dam that can retain 96,850 AF of water. While the No Project Alternative would continue reservoir and outlet works operations during construction, it would not improve water quality by re-creating a deeper pool with cooler temperatures. As a result, this alternative would only partially meet the secondary project objectives.

7.3.3 IMPACTS OF THE ALTERNATIVE

Dam and spillway modifications associated with DSOD safety requirements under the No Project Alternative would cause substantial temporary construction impacts. The main differences between construction of the No Project Alternative and construction of the proposed project that fashion the comparative significant environmental effects are as follows:

- 1) The No Project Alternative would result in a substantially greater excavation on Observation Hill to lower the spillway. A substantial amount of the hill top would be removed to provide stable slopes above the spillway.
- 2) The No Project Alternative would have less overall excavation because it would not require the borrow sites necessary for construction of the replacement dam, but there would be more excavation at Observation Hill.
- 3) The No Project Alternative would create less truck traffic on Calaveras Road north of the dam access road, because no material would be imported from off-site quarries.
- 4) The No Project Alternative would create less material requiring disposal. The approximately 500,000 cubic yards excavated for the spillway would require transport to and disposal in Disposal Site 3 or 7; Disposal Sites 2 and 5 would not be used.
- 5) The No Project Alternative would not extend the footprint of Calaveras Dam into Calaveras Creek.
- 6) Under the No Project Alternative, construction would occur only during daytime hours and would last approximately 2 years rather than 4 years.

Because the construction period would be shorter and would involve fewer vehicles and workers and less overall soil movement and materials, construction-related impacts would be on a much smaller scale than those identified for the proposed project. However, the large excavation on Observation Hill and the need for transportation and disposal of those materials nonetheless would have significant environmental effects. The discussion below describes the impacts that would be reduced or differ from those of the proposed project.

Land Use, Agricultural Resources, and Recreation

There would be fewer impacts on land use, agricultural resources, or recreation compared to the proposed project. The No Project Alternative would have no significant impacts on land use, as with the proposed project. Less disruption of recreation and grazing activities would occur because construction would affect a smaller area and take less time. With no import of materials from off-site, truck traffic on Calaveras Road would be less than the proposed project. As a result, the proposed project impact on recreation, which would be less than significant with mitigation, would be reduced.

Vegetation and Wildlife

Under the No Project Alternative, the filling and operational impacts on vegetation and wildlife resources would be eliminated because there would be no substantial changes to the water level or operations of the reservoir or flows in Alameda Creek compared with baseline conditions. Construction impacts on upland habitat would be substantially reduced and require less mitigation, and most areas affected by construction of the proposed project would be eliminated entirely. Specifically, the wetland and wildlife habitat impacts associated with borrow and

disposal activities would be substantially reduced compared to the proposed project because under the No Project Alternative the borrow areas and west haul route would not be necessary, and disposal would occur only at one Disposal Site (3 or 7). Impacts on seasonal wetlands would be substantially reduced as a result of eliminating the borrow areas and the west haul route. The No Project Alternative would also reduce the disturbance of habitat for Alameda whipsnake at Borrow Area B and California tiger salamander at Borrow Area E. Elimination of the west haul route would substantially reduce impacts on California tiger salamander and California red-legged frog from disturbance and destruction of upland habitat and traffic along the haul route, which can cause mortality. Effects on freshwater marsh at Disposal Site 3 and seep wetlands at Disposal Sites 3 and 7 would depend upon the site used, but would be reduced.

The cut into Observation Hill would remove more annual grassland habitat on that site than under the proposed project. The affected grassland provides foraging and dispersal habitat for Alameda whipsnake, but the affected area is not located within designated critical habitat for the species. The grassland is upland habitat for the California tiger salamander, providing refuge, forage, and dispersal habitat. While the local habitat disturbance on Observation Hill would be greater than under the proposed project at that site, the overall impact on annual grassland habitat from the No Project Alternative would be substantially less than that from the project as a whole.

In sum, the No Project Alternative would not cause any new significant impacts, and the significant but mitigable impacts on vegetation and wildlife of the proposed project would be substantially reduced both in the amount of habitat disturbed and the amount of restoration needed to mitigate the impact on habitat.

Fisheries and Aquatic Habitat

Under the No Project Alternative, potential impacts to fisheries resources would be similar to those for the proposed project. Baseline hydrological conditions would continue; thus, no adverse change to fisheries habitat would occur. Over the long term, the proposed project could result in some improvements to riparian habitat of Alameda Creek that could be beneficial to native fishes. Implementing the No Project Alternative would reduce, although not eliminate, the potential for construction-related water quality impacts that could have a detrimental effect on fish. This alternative could result in less potential turbidity and sediment discharge due to a smaller acreage of disturbed and exposed soils. Turbidity can result in increased water temperature, especially in shallow quiet pools, which can, in turn, reduce dissolved oxygen levels. Both effects would cause stress to fish. The potential for contaminants such as petroleum products and various chemicals used in construction activities to be accidentally introduced in spills into the water system would be reduced; however, like the proposed project the impact would be significant and require mitigation, through implementation of construction Best Management Practices (BMPs) and a Storm Water Pollution Prevention Plan (SWPPP), to reduce it to a less-than-significant level.

The No Project Alternative would not change reservoir operations from the baseline. Minimum reservoir water levels for fish habitat would be retained; however, in the long term, this may affect the viability and health of the resident fish in the reservoir. As noted, this alternative would not be expected to meet flow releases and/or bypasses consistent with the 1997 MOU. Releasing and bypassing flows consistent with the 1997 MOU under the proposed project would provide suitable and stable habitat conditions for fish populations downstream. Summer releases of cold water into Calaveras Creek downstream of the dam and into Alameda Creek to meet the 1997 MOU are assumed to not be possible under the No Project Alternative due to lack of a sufficient coldwater pool. This alternative would not alter the existing condition, but it also would not result in any benefits to fish populations in Alameda Creek.

Hydrology

Hydrology impacts under the No Project Alternative would be decreased compared to the proposed project. Flow conditions in both Calaveras and Alameda Creeks would approximate baseline conditions under the No Project Alternative with continued impoundment of water behind the Calaveras Dam and limited ACDD diversions; thus, no impacts on hydrology would result. The current lowered reservoir level (and associated reduced pool volume) would continue to limit the ability to store cold water in the reservoir. It is assumed that the release of cold water into Calaveras and Alameda Creeks during summer to meet the 1997 MOU release requirements would not occur. Hydrologic impacts associated with this alternative would be less than significant.

Water Quality

Under the No Project Alternative, water quality impacts would be reduced compared to the proposed project due to the smaller scale and shorter duration of construction. The No Project Alternative would decrease the amount of disturbed acreage with the use of only one disposal site (3 or 7) and the elimination of on-site borrow areas. Therefore, this alternative would reduce the potential extent of impacts on water quality from soil erosion, sediment discharge, and contaminants. However, the large excavation of Observation Hill could adversely affect the water quality of Calaveras Creek and the reservoir. Construction-related water quality impacts would remain significant and could be mitigated through the implementation of construction BMPs through an approved SWPPP similar to the proposed project. Water quality conditions in the reservoir would remain similar to existing conditions. Continued operation of the hypolimnetic oxygenation system would be needed indefinitely to support water quality conditions in the reservoir. Restoring the reservoir to the higher elevation proposed by the project would provide water quality benefits by increasing the cold-water pool volume; under the No Project Alternative, this beneficial impact of the proposed project would not occur.

Geology, Soils, and Seismicity

On balance, the impacts of the No Project Alternative would be similar to those of the proposed project. The large cut on Observation Hill to lower the elevation of the spillway under the No Project Alternative could result in slope failure and hazardous rock falls during construction. This would be a significant impact similar to construction-related geological hazards of the proposed project, but the hazard would be extended over a longer period due to the larger amount of required excavation. Standard practices incorporated into the proposed project design, including excavation that is benched, vegetated, and has a gentle slope (3:1), would minimize slope stability concerns and also reduce the impact of this alternative to a less-than-significant level.

Impacts related to severe erosion, slope instability, seismic loading and ground failure would be avoided at one disposal site with the use of either Disposal Site 3 or 7. However, incorporation of standard engineering designs and implementation of mitigation for the proposed project (SWPPP, post-construction soil stabilization plans, and revegetation plans) would still be required to reduce these potential impacts to less than significant levels.

Hazards and Hazardous Materials

The No Project Alternative would reduce the potential disturbance of soils containing naturally occurring asbestos (NOA) compared to the proposed project, decreasing the associated impact. The No Project Alternative would not require excavations at borrow areas, including Borrow Area B, which is mapped as Franciscan Formation rock and could release NOA and metals-laden dust. NOA and natural metals could adversely affect on-site construction workers and recreational users on Calaveras Road and within the Sunol Wilderness, become airborne, or impair water quality without proper precautions. In addition, excavation to lower the spillway would remove approximately 500,000 cubic yards of Temblor Sandstone from Observation Hill, which is less likely to contain NOA and metals. The impacts of the No Project Alternative would be reduced compared to the proposed project but would remain less than significant with mitigation due to the potential to encounter NOA and naturally occurring metals. Mitigation Measures 5.9.2a, 5.9.2b, and 5.9.2d for the proposed project, including safety measures, dust mitigation and monitoring, and the segregation of rock containing NOA and natural metals, would reduce the hazards impacts from excavation, handling and disposal of materials containing NOA and metals to less than significant levels.

Cultural Resources

Impacts on cultural resources under the No Project Alternative would be reduced compared to those identified for the proposed project, because there would be no excavation for dam foundations or borrow areas. Ground disturbance, mainly from excavations for dam foundations and borrow areas and removal of soil for disposal sites, has the potential to encounter as-yet

unknown archaeological or paleontological resources. The No Project Alternative would require a large excavation into Observation Hill and the removal of approximately 500,000 cubic yards of soil. However, the impact on cultural resources would remain less than significant with mitigation, which would include archaeological evaluation and monitoring, treatment of human remains, and measures for accidental discovery of archaeological and paleontological resources as required for the proposed project. As with the proposed project, the No Project Alternative would have no impact on historical architectural resources.

Visual Resources

Overall, impacts on visual resources under the No Project Alternative would be similar to the proposed project. Some of the visual impacts of major construction activities at the replacement dam site would be reduced under the No Project Alternative because of the much smaller scale of construction needed for the dam, borrow sites, and disposal sites. However, temporary and permanent significant and unavoidable impacts to visual resources would still occur, and impacts would be similar to those under the proposed project. The No Project Alternative would eliminate the proposed topographic alterations at Borrow Area B, Hill 1000, and the replacement dam site. However, the excavation into Observation Hill required for the No Project Alternative would be substantial and much greater than that proposed for the project. The large cut on Observation Hill would be visible from public use sites in Sunol Wilderness, as well as from Calaveras Road. The approximately 500,000 cubic yards of cut rock material would be disposed of at either Disposal Site 3 or 7.

Due to the substantial visual alterations at Observation Hill, the permanent impact on visual resources from site disturbance would be significant and unavoidable, as with the proposed project. However, the No Project Alternative would not require excavation of Hill 1000 for the new stilling basin or the use of Borrow Area B, which contribute to the significant unavoidable permanent impact under the proposed project. Although Borrow Area B, Hill 1000, and the replacement dam site would not be disturbed under the No Project Alternative, the temporary significant and unavoidable impact on visual resources would still occur due to construction activities, including excavation of Observation Hill, clearing of vegetation, grading, and the construction of haul roads.

Transportation and Circulation

Transportation and circulation impacts would be decreased compared to those of the proposed project. Under the No Project Alternative, borrow sites would not be necessary for construction of the replacement dam, and no material would be imported from off-site quarries. Therefore, truck traffic on Calaveras Road north of the dam access road would be reduced. The duration of construction would also be shortened by 2 years. However, the volume of material that would be excavated from Observation Hill would require closure of the road between Geary Road and the

dam for up to 20 months, similar to the proposed project, to reduce traffic safety hazards to less than significant. Therefore, traffic safety impacts would remain less than significant with implementation of a Traffic Control Plan that includes temporary closure of Calaveras Road. A significant and unavoidable impact for traffic safety hazard for vehicle conflicts would occur if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site. Impacts due to traffic delays during construction would be less than significant, as under the proposed project.

Air Quality

Overall, air quality impacts for the No Project Alternative would be reduced compared to the proposed project. While the approximately 500,000 cubic yards of soil excavated from Observation Hill would need to be hauled to Disposal Site 3 or 7 for disposal, there would be no hauling of on-site borrow or off-site sand and gravel for dam construction. Therefore, air emissions from truck trips generated by the No Project Alternative would likely be substantially decreased compared to those of the proposed project. Construction activities would occur for a shorter period than under the proposed project, so diesel emissions that would occur under the No Project Alternative would occur for a shorter time and other impacts, such as emissions from worker commuter vehicles, would also be reduced. These impacts would be less than significant with mitigation, as under the proposed project.

As discussed in Section 4.13, Air Quality, the BAAQMD is developing new quantitative CEQA significance thresholds for construction-related emissions of ozone precursors and particulate matter (BAAQMD 2009). The BAAQMD expects to adopt these new thresholds of significance later this year. In anticipation of the future implementation of proposed new BAAQMD CEQA thresholds of significance, alternatives to the proposed project were analyzed to determine whether they would exceed the proposed thresholds.

As stated above, emissions that would occur under the No Project Alternative would likely be lower in magnitude than the proposed project. The proposed project would need to reduce emissions of reactive organic gases (ROG), nitrogen oxides (NO_x), respirable particulate matter less than or equal to 10 microns in diameter (PM_{10}), and fine particulate matter less than or equal to 10 microns in diameter ($\text{PM}_{2.5}$) by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD thresholds. While emissions associated with the No Project Alternative were not directly quantified, the amount of borrow material required would be 13 percent of the amount required for the proposed project. While not directly correlated to emission quantities, material requirements are a reasonable gauge for determining overall project magnitude. In addition, the overall timeframe and equipment requirements for the No Project Alternative would be less than under the proposed project. Assuming that emissions, timing, and equipment operations from the No Project Alternative would be approximately 13 percent of the proposed project, in conjunction with implementation of all feasible BAAQMD

fugitive dust and exhaust controls, emissions of ROG, NO_x, PM₁₀, and PM_{2.5} would be substantially lower than the proposed project. However, based on this estimate, it appears that emissions under this alternative would still exceed the draft BAAQMD construction-emissions thresholds NO_x, PM₁₀, and PM_{2.5}. Therefore, despite likely being substantially lower than proposed project emissions, No Project Alternative construction-related emissions would likely exceed the BAAQMD draft significance thresholds. This would be a significant and unavoidable impact.

Noise and Vibration

Implementing the No Project Alternative would substantially reduce the noise and vibration impacts when compared to the proposed project. The No Project Alternative would eliminate the significant and unavoidable nighttime noise impact on residences near Disposal Site 5, which would not be used. In addition, excavation at Borrow Area E would not be needed, thereby eliminating the noise associated with the proposed project for that component of construction as well. Construction impacts, including those related to blasting would remain less than significant with mitigation. All other noise impacts, including those from long-term operations, would be less than significant under the No Project Alternative.

Utilities, Service Systems, and Public Services

Impacts related to utilities, services systems, and public services would be similar to but less intense than those described for the proposed project due to the smaller scale and shorter duration of construction. As with the proposed project, these impacts would be less than significant.

Mineral and Energy Resources

Impacts on mineral resources would be reduced compared to the proposed project because sand and gravel would not need to be imported from commercial sources or for use in construction of a new dam. Construction of the No Project Alternative would consume less fuel due to the decrease in borrow materials and shorter duration of construction. As a result, impacts related to mineral and energy resources would be reduced compared to those described for the proposed project. Operations would be unchanged from baseline conditions and would have no impact on energy resources.

Secondary Impacts

The No Project Alternative would have secondary effects related to permanently reducing the reservoir elevation. The SFPUC would likely take action to secure additional water to replace lost supplies from the reservoir and meet its goal of limiting rationing to a maximum 20-percent system-wide reduction in water service during extended droughts. Supplemental supply options, including local groundwater projects, additional Tuolumne River diversions, and desalination

(operated regionally or at Oceanside in San Francisco), each has the potential for adverse environmental effects that, in some cases, could exceed those associated with the proposed project. Wholesale customers may also be required to pursue supplemental dry-year supply to make up for drought period supply shortfalls, which could have similar or additional secondary environmental effects. The WSIP PEIR provides additional detail on supplemental supply options and their associated environmental impacts.

7.3.4 CONCLUSION

The No Project Alternative for the most part would have reduced environmental impacts relative to the proposed project, primarily due to the shorter duration and smaller scale of construction. Unlike the proposed project, however, the No Project Alternative would cause a significant and unavoidable impact on visual resources due to the disposal of soils from excavation of Observation Hill above grade. Also, it would have significant and unavoidable visual impacts on scenic resources similar to the proposed project due to the substantially larger excavation of Observation Hill. Most of the significant impacts of the project on biological resources would be avoided under the alternative. The beneficial long-term effects of returning the reservoir to its pre-DSOD restriction volume and summer cold-water releases from the reservoir would not occur. The significant and unavoidable nighttime construction noise impact at residences near the south end of the reservoir would be avoided.

The No Project Alternative would not fully meet any of the project objectives and would generate secondary effects related to permanently reducing the reservoir elevation. Further, the elevation assumed in this analysis may not be viable, given DSOD oversight would be needed to determine if the Elevation 705 pool level satisfies long-term DSOD safety requirements. The current water level restriction was intended to be an interim measure until such time as the seismic upgrade of the dam was completed.

7.4 ALTERNATIVE 2, OFF-SITE DISPOSAL ALTERNATIVE

7.4.1 DESCRIPTION OF THE ALTERNATIVE

Alternative 2 differs from the proposed project in that it would use off-site locations for most materials disposal, rather than the on-site disposal locations identified for the proposed project. This alternative was developed to reduce potentially significant impacts on biological resources associated with the on-site disposal sites. An estimated 3.8 million cubic yards (MCY) of surplus excavated material would be generated during construction. Under this alternative, 3.3 MCY of spoils would be disposed of at off-site locations. The remaining portion would be disposed of in the space between the existing dam and replacement dam (Disposal Site 2) rather than off site. Other disposal sites that would be used under the proposed project (Sites 3, 7, and 5 as a reserve) would not be disturbed. Table 7.4 summarizes the disposal volumes and locations. See Figures 3.8 and 3.12 for locations of disposal sites. The temporary haul roads and/or barge system for

moving materials would still be developed to allow access to Borrow Areas B and E but would not be needed for access to the disposal sites. Staging areas would be larger to accommodate temporary stockpiles of spoils to be disposed. Spoils would be trucked to off-site disposal areas.

Table 7.4: Estimated Disposal Quantities for the Proposed Project and Alternative 2

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 2 ¹
Disposal Site 2	470,000	470,000
Disposal Site 3	2,250,000	Not used
Disposal Site 5	Reserve disposal area	Not used
Disposal Site 7	1,060,000	Not used
Off-Site Disposal	Not applicable	3,310,000
Total	3,780,000	3,780,000
<i>Note:</i> ¹ Quantities for Alternative 2 are approximate.		

Source: URS 2008

Thus, this alternative would involve substantial increases in the number of truck trips on Calaveras Road, Interstate 680 (I-680), and possibly other regional freeways. All operations under this alternative, including reservoir and ACDD operations, would be the same as under the proposed project.

An evaluation of disposal alternatives considered three general off-site disposal options (URS 2008):

- Landfill,
- Stockpile and reuse for road improvements, and
- Reuse on other SFPUC-owned lands.

Because of the potential for naturally occurring asbestos (NOA), a large portion of the rock and earth material would not be suitable for reuse as road improvements or disposal on other SFPUC-owned lands. Therefore, for the purposes of this analysis, it is assumed that all materials would be disposed of at one or more landfill sites.

Approximately 2.4 MCY of the 3.8 MCY of surplus rock and soil are Franciscan Formation rock that potentially contains NOA. The remainder is Temblor Sandstone. This alternative assumes that 0.47 MCY of Franciscan Formation material would be placed in Disposal Site 2 because placing this amount there would not require additional disturbance beyond the limits of the area required for replacement of the existing dam. The remaining 3.3 MCY would be disposed of at already permitted landfills. Landfills accept soil and rock that are classified according to their physical and chemical constituents. There are three basic material classifications for the surplus

rock and soil generated by the project: (1) cover, (2) Class II waste, and (3) Class I waste. For the purposes of this alternatives analysis, it is assumed that Temblor Sandstone would be suitable cover material and that most material derived from the Franciscan Formation would be classified as Class II waste with between 10 and 50 percent potentially being classified as Class I waste. The nearest available facilities that can accept such waste are the Kettleman Hills Facility, which is located in Kettleman Hills, California, and accepts Class I and II waste; and Altamont Landfill, which is located in Livermore, California, and accepts Class II waste.

It is assumed that the material would be hauled off site using highway-legal dump trucks hauling loads of 18 cubic yards per truck. This would result in an estimated total of 180,000 round trips to move the 3.3 MCY of materials. The increase in number of truck trips would extend the construction schedule by approximately 4 years for a total duration of 8 years. Calaveras Road would need to be closed for approximately 6 of the 8 years (Roadifer, pers. com. 2009).

7.4.2 ABILITY TO MEET PROJECT OBJECTIVES

This alternative would meet the primary and secondary objectives of the project. Costs of implementation and duration of construction would be greater than under the proposed project.

7.4.3 IMPACTS OF THE ALTERNATIVE

The discussion below highlights the differences in impacts compared to the proposed project.

Land Use, Agricultural Resources, and Recreation

Impacts under Alternative 2 would be increased compared to the proposed project, due to greater disruption of recreational activities. Alternative 2 would not change any of the less-than-significant land use impacts discussed in Section 4.3, Land Use, Agricultural Resources, and Recreation, for the proposed project. No disposal location is proposed under this alternative that would fill an area intended for other development or use.

Compared to the proposed project, this alternative would result in less disruption of grazing activities during construction because on-site disposal sites other than Disposal Site 2 would not be disturbed. Like the proposed project, the alternative would not significantly affect agricultural land uses. However, impacts on recreational uses would be increased relative to the proposed project because of the substantially longer duration of construction and increased duration of closure of Calaveras Road due to haul traffic but like the proposed project could be mitigated to a less than significant impact. While the truck traffic could impair access and discourage some recreational use, this recreational impact would not cause long-term disruptions to access for recreational uses and remain less than significant.

Vegetation and Wildlife

Alternative 2 would reduce the impacts on vegetation and wildlife, when compared to the proposed project. The disposal sites located on the project site contain or are in the immediate vicinity of special-status species habitats. Moving the disposal to off-site locations, as proposed under Alternative 2, would reduce or eliminate potentially significant environmental impacts on these biological resources. Disposal Site 3 contains habitat for the Alameda whipsnake (and is adjacent to designated critical habitat) and California tiger salamander, freshwater marsh, seep wetlands, and some sensitive vegetation communities. Disposal Site 7 contains a small (0.11-acre) pond with habitat for the California tiger salamander and the California red-legged frog, a seep wetland, some intermittent and ephemeral channels. In addition, stands of Johnny jump-up, which provide habitat for the protected Callippe silverspot butterfly, and stands of the protected most beautiful jewel flower are adjacent to Disposal Site 7 and could be inadvertently affected by construction activities. Disposal Site 5 (a reserve site under the proposed project) contains upland habitat for California tiger salamander and some woodland/grassland habitat for Alameda whipsnake. It also contains intermittent streams and seasonal wetlands that could be filled or indirectly affected by disposal.

Mitigation measures identified in Chapter 5 for loss of habitat in the disposal sites would not be necessary under this alternative. However, potential impacts on biological resources would remain (as with the proposed project) from dam construction, borrow area excavation, and construction and operation of the ACDD bypass facility. Although construction-related impacts would be less intense under Alternative 2, they would occur for an additional 4 years under Alternative 2, impacts on sensitive species and habitat due to filling and operating the reservoir would be the same as under the proposed project (i.e., less than significant with mitigation). Overall, impacts to vegetation and wildlife would be reduced compared to the proposed project.

Fisheries and Aquatic Habitat

The use of off-site disposal locations would reduce, but not eliminate, the potential for construction-related water quality impacts that could have a detrimental effect on fish. With the proposed project, portions of Disposal Sites 3 and 7 would be in contact with the reservoir after refilling. Disposal Site 5 is located near the southerly edge of the refilled reservoir and would be inundated. Alternative 2 would reduce the possibility of direct contact of the reservoir with disposed material. This alternative also could result in less turbidity and sediment discharge in receiving waters during construction due to a smaller acreage of disturbed and exposed soils. Turbidity can result in increased water temperature, especially in shallow, quiet pools, which can, in turn, affect dissolved oxygen levels. Both effects cause stress to fish. Turbidity can result from direct in-channel disturbances (which would occur under this alternative only at Disposal Site 2 during construction) or from indirect soil erosion and runoff of fine materials into Calaveras Creek or the reservoir due to soil disturbance (which would be eliminated from

disposal site sources under this alternative). Thus, compared to the proposed project, Alternative 2 would reduce construction-related turbidity impacts on fish.

The potential for contaminants, such as petroleum products and various chemicals used in construction activities, to be accidentally introduced into the water system through spills and affect aquatic life also would be reduced; however, the impact would still remain significant and require mitigation to reduce it to a less-than-significant level. Mitigation of this impact through implementation of construction BMPs and a SWPPP would be the same as for the proposed project and would protect fish and other aquatic organisms. All operations under Alternative 2 would be the same as those under the proposed project; the only differences between this alternative and the project are in the area of construction activities, which would be reduced through off-site disposal under Alternative 2. As a result, all other fisheries-related impacts not discussed above, including those associated with operation, would be the same as those for the proposed project.

Hydrology

Hydrology impacts would be similar under Alternative 2 as the proposed project. Construction-related hydrology impacts would not be appreciably changed due to the in location of disposal sites; all impacts would be less than significant under Alternative 2. Operations would be the same as under the proposed project, and thus long-term hydrology effects would be the same as identified for the proposed project (i.e., less than significant).

Water Quality

Impacts on water quality would be reduced compared to the proposed project. Alternative 2 would decrease the amount of disturbed acreage, including that at sites located immediately adjacent to the reservoir, and therefore would reduce the potential extent of impacts on water quality from soil erosion and sediment discharge. Impacts related to soil erosion and discharge at Disposal Sites 3, 5 (reserve site), and 7 would be eliminated. However, the amount of soil disturbance under this alternative would remain extensive, and the duration of construction impacts would be substantially increased. Impacts from soil erosion and sediment discharges into water bodies would remain significant and require mitigation, which would include implementation of a SWPPP and measures to prevent accidental discharges of drilling fluids. Operational effects on water quality would be the same as those identified for the proposed project.

Geology, Soils, and Seismicity

Impacts under Alternative 2 would be reduced compared to the proposed project. Alternative 2 would eliminate the impacts associated with on-site Disposal Site 5 (reserve site) which would be less than significant with mitigation under the proposed project. Improper design of on-site

disposal sites could cause settlement, slip-out of steep embankments, or failure under seismic loading. Disposing of surplus materials off site would eliminate these impacts. Avoiding the use of on-site disposal sites would eliminate the potential impact associated with settlement of the proposed disposal site fills, although this would be prevented under the proposed project by incorporating site-specific geotechnical data in the design of the fills. Alternative 2 would also reduce the potential for erosion, but this impact would remain less than significant with mitigation due other construction activities. All other impacts related to geology, soils, and seismicity would be similar to those identified for the proposed project.

Hazards and Hazardous Materials

Hazardous materials impacts would be similar to the proposed project. Although metals and NOA-bearing materials would be permanently disposed off-site at waste facilities, reducing the potential for these materials to become airborne after disposal, excavation, hauling activities and use of Disposal Site 2 could still release NOA. This impact would remain less than significant with the mitigation detailed in Chapter 5. All other impacts related to hazards and hazardous materials would be the same as those identified for the proposed project.

Cultural Resources

Impacts on cultural resources would be decreased under Alternative 2 when compared to the proposed project. Potential impacts on cultural resources result mainly from excavations for the dam foundations and borrow areas, not from spoils disposal, which generally involves depositing materials on the surface and does not result in disturbance of buried archaeological or paleontological resources. However, some ground disturbance is necessary to establish a firm and stable base for disposal sites, and grading for this purpose could encounter buried resources. By eliminating three disposal sites, this alternative would reduce the potential for on-site disposal activities to damage or destroy buried cultural resources. While Alternative 2 would therefore somewhat reduce potential impacts compared to the proposed project, the impacts would remain less than significant with the same mitigation as required for the project (archaeological evaluation and monitoring, treatment of human remains, and measures for accidental discovery). As with the proposed project, Alternative 2 would have no impact on historic architectural resources.

Visual Resources

Overall, Alternative 2 would have similar effects on visual resources compared to the proposed project. Alternative 2 would reduce some visual impacts compared to the proposed project due to a reduced area of disturbance. However, this alternative would not eliminate or substantially reduce the visual impacts associated with excavation of Borrow Area B and Observation Hill and Hill 1000 at the dam site that would create a significant and unavoidable permanent impact. In addition, the duration of temporary construction impacts on visual resources would be increased

by approximately 4 years, during which time the significant and unavoidable temporary impact identified for the proposed project would occur.

Transportation and Circulation

Transportation and circulation impacts under Alternative 2 would be increased compared to the proposed project. The use of off-site disposal locations would substantially increase the number of construction vehicle trips on Calaveras Road and regional highways that would be used for access to the off-site disposal locations. Kettleman Hills Facility is located approximately 200 miles from Calaveras Reservoir. Altamont Landfill is located approximately 40 miles away. It is assumed that the material would be hauled off site using highway-legal dump trucks, hauling 18-cubic-yard loads each. This would result in a total of approximately 180,000 round trips to move the 3.3 MCY of materials (URS 2008).

Construction activity associated with hauling materials from the project work area would add a substantial number of truck trips to Calaveras Road during two 10-hour shifts per day, including peak commute hour periods on regional highways. To accomplish disposal of all materials in a 4-year period would result in a volume of traffic that would not be feasible on the narrow portion of Calaveras Road between Geary Road and the dam access road, because of tight turns and limited turnout space. Therefore, the duration of closure of Calaveras Road would be approximately 4 years longer than for the proposed project. This would increase the potentially significant and unavoidable traffic safety impact that would occur under the proposed project if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site. In addition, construction-related cumulative transportation impacts under Alternative 2 would increase. Under the proposed project, construction-related traffic congestion and delay impacts would be less than significant with mitigation.

This alternative would concentrate a large amount of heavy truck traffic on Calaveras Road, and the wear-and-tear effects on the road surface could be substantial. Mitigation similar to that identified for the proposed project, including implementation of a post-construction roadway repair/rehabilitation program, would be required. Compared to the proposed project, this alternative would result in increased delays for vehicles using Calaveras Road due to the substantial increase in the number of trucks using Calaveras Road and traveling at relatively slow speeds. This truck traffic would increase the potential for traffic safety hazards for vehicles, bicyclists, and pedestrians on Calaveras Road. Because of increased truck trips, bicyclists on Calaveras Road would be disrupted more frequently than under the proposed project.

Air Quality

Due to the increase in haul truck trips to off-site disposal areas, Alternative 2 would have increased greenhouse gas (GHG) emissions compared to the proposed project. GHG emissions are regional and global in nature, and the specific source location is not as relevant as the quantity

of emissions. It is assumed that transport vehicles would implement all reduction measures presented in Section 4.13, Air Quality, including maintaining tire inflation to manufacturers' specifications and educating construction workers. GHG emissions generated by construction activities under Alternative 2 would not conflict with the stated goal of reducing GHG emissions in California to 1990 levels by 2020 (e.g., by making a substantial contribution to global climate change) and would comply with all California Air Resources Board and CCSF reduction measures. Thus, although emissions would be greater than under the project, this alternative would result in a less-than-significant impact. As under the proposed project, operation and maintenance activities would be unchanged relative to existing conditions.

Alternative 2 would increase total regional emissions of particulate, ozone precursors, and diesel particulate matter (diesel PM) due to increased off-site hauling. Depending on haul truck routing, these emissions could expose a greater number of sensitive receptors in population centers to increased diesel emissions and related odors. Haul truck traffic would be concentrated on Calaveras Road, and emissions would be greater than under the proposed project. The same sensitive receptor on Calaveras Road (Sensitive Receptor D) would be affected by the truck trips. Because of the large scale of construction-related activities, including truck traffic, the impact would be significant, although regulations requiring new diesel engines to substantially reduce emissions by 2010 may reduce the impact to a less-than-significant level. In addition, short-term construction-related significant cumulative air quality impacts would increase.

Generation of temporary, construction-related emissions would be significant and require mitigation under Alternative 2. Project construction-related activities would generate temporary emissions of criteria air pollutants and ozone precursors from motorized vehicles and heavy equipment. Under Alternative 2, air pollution from motor vehicles and heavy-duty equipment within the construction area is expected to be similar to that under the proposed project, because heavy-duty off-road truck trips to Disposal Sites 3 and 7 (and 5 as a reserve) near the reservoir would be replaced with on-road truck trips traveling along Calaveras Road. Without the use of on-site disposal proposed for the project, Alternative 2 also would decrease the soil disturbance and volumes required in the project area and the related fugitive PM₁₀ dust emissions. However, substantial generation of fugitive PM₁₀ dust emissions primarily associated with ground disturbance and material transport would still be generated on the project site, and the mitigation measures identified for the project in Chapter 5 would still be necessary to avoid significant air quality impacts. Ground disturbance and material transport could also result in generation of airborne NO_x; as with fugitive PM₁₀, the mitigation measures for fugitive dust and exhaust emissions identified for the proposed project in Chapter 5 would still be necessary and would reduce airborne NO_x to less-than-significant levels.

The proposed project would need to reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD thresholds. This level of reduction is not likely to be achieved even with mitigation, resulting in a

significant and unavoidable air quality impact during construction for the proposed project. Alternative 2 would have even greater emissions than the proposed project, requiring an even higher level of reduction to be below the BAAQMD thresholds. Even with implementation of mitigation (such as controls for fugitive dust, exhaust, and NOA), emissions for Alternative 2 would likely exceed the BAAQMD draft significance thresholds and would result in a significant and unavoidable impact, like the proposed project.

Noise and Vibration

Construction noise and vibration impacts in the area surrounding the dam would be similar to those of the proposed project, as described in Section 4.14, Noise and Vibration. Traffic-generated noise on local roads would increase in magnitude and duration, particularly near the site of Sensitive Receptor D, the closest residential receptor near Calaveras Road in Sunol Valley. Mitigation measures identified in Chapter 5 to reduce traffic impacts and in Chapter 6, Other Topics Required by CEQA, to reduce cumulative noise impacts could help to reduce the increased traffic noise that would be generated under this alternative. This alternative would reduce noise impacts on sensitive receptors near the southern end of the reservoir at Disposal Site 5, but the significant and unavoidable noise impact from back-up beepers at Borrow Area E would remain.

The closest landfill that can accept the waste materials classified as Class I is Kettleman Hills Facility, located 200 miles from Calaveras Reservoir. Under this alternative, additional traffic noise would be generated on regional highways that would otherwise not experience as substantial construction traffic. Calaveras Road provides access to I-680, so the impacts would be related primarily to changes in use of Calaveras Road and I-680. Some portions of the town of Sunol also might experience increased noise effects if some trucks were to use State Route 84 for access to I-880. This new impact would be temporary and less than significant with mitigation, including noise controls to reduce the level and duration of disturbance.

Long-term disturbances related to operations would be less than significant, as with the proposed project.

Utilities, Service Systems, and Public Services

Impacts would be increased under Alternative 2 when compared to the proposed project. The increase in truck trips and longer hauls to off-site disposal locations could affect public services by potentially resulting in more traffic safety incidents on Calaveras Road and state highways. This would require greater emergency response resources, although the impact would still be less than significant, as with the proposed project. Impacts on utilities would be the same as those identified for the proposed project and would be less than significant.

Mineral and Energy Resources

Mineral and energy resources impacts under Alternative 2 would be increased compared to those of the proposed project. Alternative 2 would result in substantial additional consumption of fuel for longer truck trips to and from the disposal sites. The amount of fossil fuel consumed as part of this alternative would depend on the combination of disposal sites used. Because of the potential long haul routes (up to approximately 200 miles) for disposal and the large volume of material to be transported, this alternative would use substantially more fuel than the proposed project. The increased fuel use for this alternative compared to the proposed project would be a potentially significant impact, the severity of which could be reduced by using fuel-efficient trucks for spoils hauling. Nonetheless, this alternative would substantially increase fuel consumption compared to the proposed project. Impacts on mineral resources would be the same as those identified for the proposed project because the alternative would use the same amount of materials. Operations would be the same as the proposed project and would have no impact on energy resources.

7.4.4 CONCLUSION

Relative to the proposed project, the Off-Site Disposal Alternative would eliminate some significant impacts on sensitive plant and animal species and habitats and would reduce some construction-related impacts on fish, water quality, and cultural resources. However, transportation of disposal materials to remote, off-site locations would increase other impacts and create new impacts that would not occur under the proposed project. The substantial increase in the number of truck trips associated with hauling materials off site and the associated 4-year increase in the construction schedule would increase transportation impacts, traffic safety hazards, including the significant and unavoidable impact associated with closure of Calaveras Road, as well as impacts on access to recreation. The increase in numbers of truck trips and haul distances would also increase fuel consumption and the associated impact on energy resources. Air pollutant emissions would be greater than under the proposed project as a result of the increase in truck trips, particularly if transport to Kettleman Hills is required. Impacts on visual resources would be similar to the proposed project and significant and unavoidable. Impacts of future operations would be unchanged compared to the proposed project.

The Off-Site Disposal Alternative would meet all of the project objectives. However, the large increase in truck trips would increase the project duration by approximately 4 years and would increase the total project costs by approximately 20 percent (URS 2008).

7.5 ALTERNATIVE 3, OFF-SITE BORROW ALTERNATIVE

7.5.1 DESCRIPTION OF THE ALTERNATIVE

Alternative 3 differs from the proposed project in that it would import clay and rock for construction of the replacement dam from off-site locations. This alternative was developed to reduce potentially significant impacts on biological, cultural, and visual resources associated with on-site borrow areas. The proposed project would use approximately 1.5 MCY of material from Borrow Areas B and E as fill material for the dam. Under Alternative 3, this material would be obtained from off-site locations, and Borrow Areas B and E would not be disturbed (see Table 7.5). Precise off-site locations for the needed material have not been identified, but for purposes of this analysis, it is assumed that clay materials would be obtained from existing facilities within approximately 40 miles travel distance that are already licensed and permitted.

Table 7.5: Comparison of Construction Source Materials for the Proposed Project and Alternative 3

Source of Material	Type of Material	Amount of Source Material (cubic yards)	
		Proposed Project	Alternative 3 ¹
Spillway excavation	Temblor Sandstone	1,470,000	1,470,000
Borrow Area B	Blueschist/greywacke	764,000	Not used
Borrow Area E	Clay alluvium	755,000	Not used
Imported Filter and Drain Material	Sand and Gravel	330,000	330,000
Off-Site Borrow (imported fill materials)	Clay for core	Not applicable	755,000
	Durable rock		764,000
Total		3,319,000	3,319,000
<i>Note:</i> ¹ Quantities for Alternative 3 are approximate.			

Sources: URS 2005a and Forrest, pers. com. 2009

As a result, construction and use of the west haul route would not be required. Gravel and sand for use as filters and drains in the replacement dam would be obtained off-site under both the proposed project and this alternative. Dam construction materials to be obtained off site would need to be trucked from their sources to the new dam construction area. Thus, this alternative would involve substantial increases in the number of truck trips on nearby roads and freeways. Operations under this alternative would be the same as under the proposed project.

Table 7.6 identifies the differences in estimated disposal quantities between the proposed project and this alternative. Disposal quantities for this alternative are less than for the proposed project because there is no disposal of overburden from on-site borrow areas.

Table 7.6: Estimated Disposal Quantities for the Proposed Project and Alternative 3

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 3 ¹
Disposal Site 2	470,000	470,000
Disposal Site 3	2,250,000	2,080,000
Disposal Site 5	Reserve disposal area	Reserve disposal area
Disposal Site 7	1,060,000	1,060,000
Total	3,780,000	3,610,000
<i>Note:</i> ¹ Quantities for Alternative 3 are approximate and are less than for the proposed project because there is no disposal of overburden from on-site borrow areas.		

Source: Forrest, pers. com. 2009

Other aspects of the replacement dam and appurtenances would remain as described in Chapter 3, Project Description, including a new dam and spillway, a new intake tower, relocated cone valve, extended Calaveras Pipeline, and new supporting electrical buildings. The existing dam would be used as a cofferdam during construction, as described. The rate of embankment construction would be controlled by the long duration of hauling (approximately 2 years) and the available staging areas at the site would be used for stockpiles of the imported materials. As a result, the duration of construction would be extended by an additional 2 years for a total of 6 years. This alternative would require closure of Calaveras Road during the 2 years of hauling.

7.5.2 ABILITY TO MEET PROJECT OBJECTIVES

This alternative would meet the primary and secondary objectives of the project. Costs of implementation and duration of construction would be greater than under the proposed project.

7.5.3 IMPACTS OF THE ALTERNATIVE

The discussion below highlights the differences in impacts compared to the proposed project.

Land Use, Agricultural Resources, and Recreation

Impacts under Alternative 3 would be increased compared to the proposed project, due to greater disruption of recreational activities. Alternative 3 would not change any of the less-than-significant land use impacts discussed in Section 4.3, Land Use, Agricultural Resources, and Recreation, for the proposed project. No borrow location is proposed in this alternative that would excavate an area intended for other development or use. Compared to the proposed project, this alternative would result in less disruption of grazing activities during construction due to the reduced areas of disturbance. Like the proposed project, the alternative would not

significantly affect agricultural land uses. However, impacts on recreational uses would be increased relative to the proposed project because of the longer duration of construction and longer closure of Calaveras Road but would remain less than significant with mitigation as for the proposed project. While the construction truck traffic could impair access and discourage some recreational use, it would not cause long-term disruptions to access for recreational uses.

Vegetation and Wildlife

The wetland and wildlife habitat impacts associated with borrow activities would be substantially reduced compared to the proposed project. Alternative 3 would avoid disturbance of Borrow Areas B and E, and would also not require construction of the west haul route to Borrow Area E (assuming that Disposal Site 5, a reserve site, would also not be used). Impacts on seasonal wetlands would be substantially reduced as a result of eliminating the borrow areas and the west haul route. Eliminating the use of Disposal Site 5 would further reduce impacts on seasonal wetlands located south of the reservoir. Alternative 3 would also reduce the disturbance of habitat for Alameda whipsnake at Borrow Area B and California tiger salamander at Borrow Area E. Elimination of the west haul route would substantially reduce impacts on California tiger salamander and California red-legged frog from disturbance and destruction of upland habitat and traffic along the haul route, which can cause mortality. As with the proposed project, potential impacts on these and other sensitive species due to dam construction, use of disposal sites, and construction and operation of the ACDD bypass facility under this alternative would be less than significant with mitigation (detailed in Chapter 5). Although construction-related impacts would be less intense under Alternative 2, they would occur for an additional 2 years. The impacts on sensitive species and habitat that would result from filling and operating the reservoir under Alternative 3 would also be the same as under the proposed project (i.e., less than significant with mitigation).

Fisheries and Aquatic Habitat

The use of off-site borrow locations would reduce, although not eliminate, the potential for construction-related water quality impacts that could have a detrimental effect on fish. Alternative 3 would reduce ground disturbance associated with the excavation of borrow areas and construction and use of the west haul route. The smaller area of disturbed and exposed soils could result in less soil erosion and runoff that could enter waterways that provide aquatic habitat. Therefore, less turbidity and sediment discharge would occur in receiving waters during construction, relative to the proposed project. Turbidity can result in increased water temperature, especially in shallow, quiet pools, which can, in turn, affect dissolved oxygen levels. Both effects cause stress to fish. Turbidity can result from indirect soil erosion and runoff of fine materials into Calaveras Creek or the reservoir due to soil disturbance, which would be eliminated from borrow areas and the West Haul Route under this alternative. The potential for contaminants, such as petroleum products and various chemicals used in construction activities,

to be accidentally introduced into the water system through spills and affect aquatic life also would be reduced; however, the impact would still remain significant and require mitigation to reduce it to a less-than-significant level. Mitigation of this impact through implementation of construction BMPs and a SWPPP would be the same as for the proposed project and would protect fish and other aquatic organisms. All other fisheries-related impacts, including those associated with reservoir operations, would be the same as those identified for the proposed project.

Hydrology

Hydrology impacts under Alternative 3 would be similar to those of the proposed project. Construction-related hydrology impacts would not be appreciably changed due to the change in source of clay and rock. Operations would be the same as under the proposed project, and thus long-term hydrology effects would be the same as those identified for the proposed project (i.e., less than significant).

Water Quality

Alternative 3 would decrease the amount of disturbed acreage and therefore would reduce the potential extent of impacts on water quality from soil erosion and sediment discharge. Elimination of Borrow Areas B and E and the west haul route would reduce these impacts. However, the amount of soil disturbance for Alternative 3 would remain extensive due to dam construction, staging areas, and on-site disposal, and the duration of construction impacts would be substantially increased. Mitigation (implementation of a SWPPP and measures to prevent accidental discharges of drilling fluids) would be required to reduce impacts on water quality to less-than-significant levels. Alternative 3 would substantially reduce the potential for impacts on reservoir water quality during and following inundation due to contact with borrow materials containing NOA, metals, or contaminants used in construction. All other water quality impacts would be the same as those identified for the proposed project.

Geology, Soils, and Seismicity

Impacts related to geology, soils, and seismicity would be reduced under Alternative 3. By eliminating the use of on-site borrow areas, Alternative 3 would reduce the impact of severe erosion and slope instability hazards. Borrow Area B, in particular, is in an area of moderate to steep slopes that descend to Calaveras Creek. There would also be less material requiring on-site disposal. While these impacts would be reduced, they would remain significant because excavation and preparation of the dam foundation area and grading of access roads and disposal sites would be subject to substantial soil loss and erosion by wind and stormwater runoff. Mitigation, including implementation of a SWPPP and post-construction soil stabilization and revegetation plans, would reduce this impact to a less-than-significant level. All other impacts

related to geology, soils, and seismicity, including those associated with fill disposal and operations, would be the same as under the proposed project.

Hazards and Hazardous Materials

Alternative 3 would reduce the impact associated with the release of airborne NOA and naturally occurring metals from excavation by avoiding disturbance of the on-site borrow areas. Blasting of Borrow Area B, known to contain Franciscan Complex rocks, would not occur under this alternative. However, because construction activities associated with the dam site and disposal sites may still produce dust containing NOA and naturally occurring metals, this impact would remain significant. Mitigation, including geologic investigations, a dust management plan, and monitoring, would reduce this impact to a less-than-significant level for recreational users and construction workers. All other impacts related to hazards and hazardous materials would be the same as those identified for the proposed project.

Cultural Resources

Impacts on cultural resources would be reduced compared to the proposed project. The potential impacts on cultural resources result mainly from excavations for the dam foundations and borrow areas. By eliminating the two borrow areas, this alternative would reduce the potential for on-site borrow activities to damage or destroy buried cultural resources. However, excavation of the dam foundation could still have potential impacts on unknown cultural resources. In addition, some ground disturbance is necessary to establish a firm and stable base for disposal sites, and grading for this purpose could encounter buried resources. While Alternative 3 would reduce potential cultural resources impacts compared to the proposed project, the impacts would remain less than significant with the same mitigation as required for the project, including archaeological evaluation and monitoring, treatment of human remains, and measures for accidental discovery. As with the proposed project, Alternative 3 would have no impact on historic architectural resources.

Visual Resources

Visual resources impacts under Alternative 3 would be similar to those for the proposed project. Alternative 3 would reduce visual impacts when compared to the proposed project, but both temporary and permanent significant and unavoidable impacts would remain. The permanent impact on views from Sunol Wilderness would be reduced but remain significant and unavoidable because although Borrow Area B would not be excavated, the visually significant excavation of Observation Hill for the spillway and Hill 1000 for the stilling basin would still occur. Visual impacts from site disturbance of Borrow Area E would also be eliminated, although this area would be submerged by the restoration of water levels from reservoir operations, similar to the proposed project. The duration of temporary impacts on visual resources would increase by approximately 2 years due to the longer duration of construction.

during which time the significant and unavoidable temporary impact from construction activities identified for the proposed project would occur. All other impacts to visual resources, including those associated with on-site disposal sites and reservoir operations, would be the same as with the proposed project.

Transportation and Circulation

Transportation and circulation impacts would be increased when compared to the proposed project. The use of off-site sources for clay and rock would substantially increase the number of construction vehicle trips on Calaveras Road and on regional highways. Construction materials would be transported from sources assumed to be located approximately 40 miles away. It is assumed that the material would be hauled from off-site locations using highway-legal dump trucks, hauling 18-cubic-yard loads. Based on this assumption, a total of approximately 83,000 round trips would be made to move the 1.5 MCY of materials.

Construction activity associated with hauling materials to the project work area would add a substantial number of truck trips to Calaveras Road during two 10-hour shifts per day, including peak commute hour periods on regional highways. The volume of traffic would not be feasible on the narrow portion of Calaveras Road between Geary Road and the dam access road, because of tight turns and limited turnout space. Therefore, the duration of closure of Calaveras Road would be approximately 2 years longer than for the proposed project (Roadifer, pers. com. 2009). This would increase the potentially significant and unavoidable traffic safety impact that would occur under the proposed project if Alameda County does not permit the temporary closure of the portion of Calaveras Road from Geary Road to the dam site. In addition, construction-related cumulative transportation impacts would increase.

This alternative would increase heavy truck traffic on Calaveras Road, and the wear-and-tear effects on the road surface could be substantial. Mitigation similar to that identified for the proposed project, including implementation of a post-construction roadway repair/rehabilitation program, would be required.

Compared to the proposed project, this alternative would result in increased delays for vehicles using Calaveras Road due to the substantial increase in the number of trucks using Calaveras Road and traveling at relatively slow speeds. This truck traffic would increase the potential for traffic safety hazards for vehicles, bicyclists, and pedestrians on Calaveras Road. Bicyclists on Calaveras Road would be disrupted more frequently than under the proposed project because of increased truck trips.

Air Quality

Due to the increase in haul truck trips to off-site borrow areas, Alternative 3 would have increased GHG emissions compared to the proposed project. GHG emissions are regional and

global in nature, and the specific source location is not as relevant as the quantity of emissions. It is assumed that transport vehicles would implement all reduction measures presented in Section 4.13, Air Quality, including maintaining tire inflation to manufacturers' specifications and educating construction workers. GHG emissions generated by construction activities under Alternative 3 would not conflict with the stated goal of reducing GHG emissions in California to 1990 levels by 2020 (e.g., by making a substantial contribution to global climate change) and would comply with all California Air Resources Board and CCSF reduction measures. Thus, although emissions would be greater than under the project, this alternative would result in a less-than-significant impact. As under the proposed project, operation and maintenance activities would be unchanged relative to existing conditions.

The off-site borrow alternative would increase total regional emissions of particulate, ozone precursors, and diesel PM due to increased off-site hauling. Depending on haul truck routing, these emissions could expose a greater number of sensitive receptors in population centers to increased diesel emissions and related odors. Haul truck traffic would be concentrated on Calaveras Road, and emissions would be greater than under the proposed project. The same sensitive receptor on Calaveras Road (Sensitive Receptor D) would be affected by the truck trips. Because of the large scale of construction-related activities, including truck traffic, the impact would be significant, although regulations requiring new diesel engines to substantially reduce emissions by 2010 may reduce the impact to a less-than-significant level. In addition, short-term construction-related significant cumulative air quality impacts would increase. Generation of temporary, construction-related emissions would be significant and require mitigation under Alternative 3. Project construction-related activities would generate temporary emissions of criteria air pollutants and ozone precursors from motorized vehicles and heavy equipment. Under Alternative 3, air pollution from motor vehicles and heavy-duty equipment within the project construction area is expected to be similar to that under the proposed project, because heavy-duty off-road truck trips to borrow areas near the reservoir would be replaced with on-road truck trips traveling along Calaveras Road.

Without the use of on-site borrow proposed for the project, Alternative 3 also would decrease the soil disturbance and volumes required in the project area and the related fugitive PM₁₀ dust emissions. However, substantial generation of fugitive PM₁₀ dust emissions primarily associated with ground disturbance and material transport would still be generated on the project site, and the mitigation measures identified for the project in Chapter 5 would still be necessary to avoid significant air quality impacts. Ground disturbance and material transport could also result in generation of airborne NOA; as with fugitive PM₁₀, the mitigation measures for fugitive dust and exhaust emissions, identified for the proposed project in Chapter 5, would still be necessary and would reduce airborne NOA to less-than-significant levels.

The proposed project would need to reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD

thresholds. This level of reduction is not likely to be achieved even with mitigation, resulting in a significant and unavoidable air quality impact during construction for the proposed project.

Alternative 3 would have even greater emissions than the proposed project, requiring an even higher level of reduction to be below the BAAQMD thresholds. Even with implementation of mitigation (such as controls for fugitive dust, exhaust, and NOA), emissions for Alternative 3 would likely exceed the BAAQMD draft significance thresholds and would result in a significant and unavoidable impact, like the proposed project.

Noise and Vibration

Noise and vibration impacts under Alternative 3 would be decreased compared to the proposed project. Alternative 3 would eliminate the significant and unavoidable noise impact associated with nighttime activities, specifically the use of back-up beepers at Borrow Area E. Blasting would be reduced by eliminating use of Borrow Area B, located close to the Sunol Wilderness. Blasting would remain a requirement for spillway construction. Construction noise and vibration in the area surrounding the dam would remain essentially the same as described for the proposed project in Section 4.14, Noise and Vibration. The increase in truck trips would increase the magnitude and duration of traffic-generated noise on local roads, particularly near the site of Sensitive Receptor D, the closest residential receptor near Calaveras Road in Sunol Valley. Mitigation measures identified in Chapter 5 to reduce traffic impacts and in Chapter 6, Other Topics Required by CEQA, to reduce cumulative noise impacts could help to reduce the increased traffic noise that would be generated under this alternative. This alternative also would reduce less than significant noise impacts on sensitive receptors near the southern end of the reservoir. Long-term disturbances related to operations would be less than significant, as with the proposed project.

Utilities, Service Systems, and Public Services

Impacts would be increased under Alternative 3 when compared to the proposed project. Effects on public services would be increased compared to the proposed project due to the greater numbers of truck trips and longer hauls to off-site materials sources. This could potentially result in more traffic safety incidents on Calaveras Road and state highways, requiring greater emergency response resources, although the impact would still be less than significant, as with the proposed project. Impacts on utilities and service systems would be the same as those identified for the proposed project and would be less than significant.

Mineral and Energy Resources

Mineral and energy resources impacts under Alternative 3 would be increased compared to the proposed project. This alternative would result in substantial additional consumption of fuel for longer truck trips to and from the borrow areas. The amount of fossil fuel consumed as part of this alternative would depend on the locations and combination of borrow areas used. However,

because of the large volume of construction material to be transported, and the potential for haul routes of up to approximately 40 miles, this alternative would use substantially more fuel than the proposed project. The severity of this potentially significant impact could be reduced with the use of fuel-efficient trucks for hauling. Nonetheless, this alternative would use substantially more fuel than the proposed project. Impacts on mineral resources would be greater than the proposed project because the alternative would use off-site commercial sources for clay and rock rather than on-site borrow areas, although the amount of material needed would be the same. Operations would be the same as the proposed project and would have no impact on energy resources.

7.5.4 CONCLUSION

Implementing Alternative 3 would eliminate some significant impacts on sensitive plant and animal species and habitats and would eliminate a significant and unavoidable construction related noise impact. However, importation of rock and clay from off-site locations would increase other impacts and create additional impacts that do not occur under the proposed project. The substantial increase in the number of truck trips and haul distances associated with importing rock and clay materials for the project and the associated increase in construction schedule would increase transportation impacts and traffic safety hazards, including the significant and unavoidable impact associated with closure of Calaveras Road. Alternative 3 would also increase fuel consumption and the associated impact on energy resources. Air pollutant emissions would be greater than under the proposed project, although would remain less than significant with mitigation. Impacts of future operations would be unchanged compared to the proposed project.

Alternative 3 would meet all of the project objectives. However, the increase in the number of truck trips would increase the project duration by up to 2 years. This, in combination with the costs of hauling and purchase of rock and clay from commercial sources, would also substantially increase total project costs.

7.6 ALTERNATIVE 4, CONSOLIDATED ON-SITE DISPOSAL ALTERNATIVE

7.6.1 DESCRIPTION OF THE ALTERNATIVE

Alternative 4 would eliminate use of Disposal Site 7 to reduce impacts on biological resources at Disposal Site 7. Disposal Site 7 contains a small pond (0.11 acre), seep wetlands (0.17 acre), and habitats potentially used by the federally listed California tiger salamander and California red-legged frog. It is also adjacent to stands of the protected most beautiful jewel flower and habitat that includes the host plant of the federally listed Callippe silverspot butterfly. Construction activities under this alternative would be the same as under the proposed project, except for the following changes: (1) materials that would have been placed in Disposal Site 7 would instead be

placed in the reserve Disposal Site 5, (2) the reserve capacity of Disposal Site 5 would be eliminated, (3) additional area for temporary stockpiling of disposal materials would be required while Borrow Area E is excavated to create Disposal Site 5, and (4) the construction duration would increase by approximately 6 months. Operations for this alternative would be the same as for the proposed project.

Under the proposed project, Disposal Site 7 would have a capacity of approximately 1,060,000 cubic yards and would be located on the east side of the reservoir at Corral Point. This disposal site would be constructed in a shallow valley between a small hill on the west side and a taller hill on the east side. Under Alternative 4, the material targeted for Disposal Site 7 would instead be placed in reserve Disposal Site 5. Disposal Site 5 would be located within the excavation created by Borrow Area E at the south end of the reservoir and would be inundated by the reservoir when the project is completed. The first 840,000 cubic yards would effectively restore the borrow area to existing grade. Materials disposed in Disposal Site 5 in excess of this amount would be mounded above the existing grade but would still be inundated by the reservoir when the project is completed. Table 7.7 identifies the differences in allocation of estimated disposal quantities between the proposed project and this alternative.

Table 7.7: Estimated Disposal Quantities for the Proposed Project and Alternative 4

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 4 ¹
Disposal Site 2	470,000	470,000
Disposal Site 3	2,250,000	2,250,000
Disposal Site 5	Reserve disposal area	1,060,000
Disposal Site 7	1,060,000	Not used
Total	3,780,000	3,780,000
<i>Note:</i> ¹ Quantities for Alternative 4 are approximate.		

Source: URS 2008

Since Disposal Site 5 is located within the excavation created by Borrow Area E, use of the site would not be possible until the after the borrow materials (clays) are removed and the dam embankment is constructed. Therefore, approximately 1,060,000 cubic yards of material would need to be temporarily stockpiled. Materials could be stockpiled adjacent to Borrow Area E and placed into the disposal site after removal of clay materials in the second construction season (URS 2008). The excavated earth and rockfill materials that would be placed in Disposal Site 5 would likely include concentrations of NOA.

Because of the double handling of disposal materials and haul distances under Alternative 4, fuel consumption would be an estimated 180,000 gallons greater than under the proposed project (URS 2008) and the construction period would increase by approximately 6 months. Under the alternative, no reserve capacity for disposal materials would be provided. Should disposal volumes during construction be found to be larger than estimated, additional sites would need to be identified at that time, potentially extending the duration of construction.

7.6.2 ABILITY TO MEET PROJECT OBJECTIVES

This alternative would meet the primary and secondary objectives of the project. Costs of implementation and duration of construction would be greater than under the proposed project.

7.6.3 IMPACTS OF THE ALTERNATIVE

The discussion below highlights the differences in impacts compared to the proposed project.

Land Use, Agricultural Resources, and Recreation

Overall, land use impacts would be similar to those of the proposed project. This alternative would result in less disruption of grazing activities during construction due to the reduced area of disturbance by eliminating Disposal Site 7. Like the proposed project, the alternative would not significantly affect agricultural land uses. Recreation impacts would be marginally increased because the duration of construction would increase by 6 months but like the proposed project would remain less than significant with mitigation.

Vegetation and Wildlife

Alternative 4 would reduce impacts to vegetation and wildlife compared to the proposed project. Alternative 4 would eliminate potential impacts associated with Disposal Site 7. Disposal Site 7 contains 21 acres of potential upland dispersal habitat for California tiger salamander and California red-legged frog and 0.43 acre of potential aquatic habitat (Pond 9 and seep and seasonal wetlands). Alternative 4 would therefore eliminate potential impacts on California red-legged frog and California tiger salamander habitat in this area. Disposal Site 7 also contains 22 acres of grassland habitat potentially used by Alameda whipsnake and includes serpentine grasslands. Proposed Disposal Site 7 is also adjacent to stands of the protected most beautiful jewel flower and habitat that includes the host plant of the federally listed Callippe silverspot butterfly.

Disposal Site 5 is entirely within the area of excavation for Borrow Area E and therefore, would be disturbed under both the proposed project and Alternative 4. As detailed above, use of Disposal Site 5 under Alternative 4 would not be possible until the after the borrow materials (clays) are removed and the dam embankment is constructed. Therefore approximately 1,060,000

cubic yards of material would need to be temporarily stockpiled adjacent to the site creating additional or new impacts to vegetation and wildlife in this area, including potential impacts on upland dispersal habitat for California tiger salamander and U.S. Fish and Wildlife Service–proposed critical habitat for California red-legged frog, as well as potential impacts on seep wetlands and Calaveras Creek which adjoin Borrow Area E. Under this alternative, other impacts on vegetation, wildlife, and wetlands and waters of the United States would be equivalent to those under the proposed project. These impacts would be less than significant with implementation of the mitigation measures identified for the proposed project.

Fisheries and Aquatic Habitat

Overall, fisheries and aquatic habitat impacts would be similar to the proposed project. Ground disturbance would be reduced at Disposal Site 7, but increased at Disposal Site 5. Inundation effects would be similar to the proposed project. Disposal Site 5 (Borrow Area E) would be inundated under both this alternative and the project.

Other construction and operational impacts on fisheries under Alternative 4 would be similar to those identified for the proposed project.

Hydrology

Hydrology impacts would be similar under Alternative 4 as the proposed project. The shift in use of disposal sites under Alternative 4 would not result in construction-related hydrology impacts that would be appreciably different from those of the proposed project. Operations would be the same as under the proposed project, and thus long-term hydrology effects would be the same.

Water Quality

Alternative 4 would increase water quality impacts relative to the proposed project. Removal of Disposal Site 7 from the project would remove the need for site stabilization and management of runoff from this disposal site area. However, additional stockpiling and double-handling of spoils that would go to Disposal Site 5 would be a source of erosion and sediment discharge into the reservoir resulting in increased impacts.

Under the proposed project, fine-grained materials that may contain NOA and metals would be placed in disposal sites at or above 760 feet (4 feet above the proposed normal maximum reservoir surface elevation of 756 feet) to prevent NOA and metals from coming into contact with the reservoir surface water. Under Alternative 4, fine-grained materials potentially containing NOA would be placed at Disposal Site 3 at or above 760 feet to avoid potential water quality impacts similar to the proposed project.

Similar to the proposed project, potential impacts on water quality would be less than significant with implementation of the mitigation measures identified for the proposed project, including soils investigations to properly classify materials and design and construction of disposal sites to minimize releases. All other aspects of construction and operation impacts under Alternative 4 would be the same as under the proposed project.

Geology, Soils, and Seismicity

Overall, geology, soils, and seismicity impacts for Alternative 4 would be similar to those for the proposed project. Greater potential for slope instability would occur under Alternative 4 as compared to the proposed project because unlike the proposed project, Alternative 4 requires use of Disposal Site 5. Use of Disposal Site 5 would require a geotechnical evaluation and mitigation measures to ensure stability under fluctuating inundation levels. Like the project, any impacts could be reduced to less than significant with mitigation. This alternative would eliminate the less than significant impacts related to erosion, slope instability, seismic loading, and slope stability associated with Disposal Site 7. All other impacts associated with Disposal Site 7, which would not be used, would be similar for Disposal Site 5.

Hazards and Hazardous Materials

Impacts would be similar those of the proposed project due to the similar types of construction activities and amounts of material being disturbed. Double handling of NOA-containing materials could increase potential impacts on construction workers and recreational users. However, this impact would be mitigated to a less-than-significant level through implementation of the same mitigation measures as identified for the proposed project.

Cultural Resources

Overall, Alternative 4 would have cultural resources impacts similar to those of the proposed project. Effects on cultural resources under Alternative 4 would be slightly reduced because ground disturbance at Disposal Site 7 would be eliminated. The impact on cultural resources would be less than significant with mitigation, which would include archaeological evaluation and monitoring, treatment of human remains, and measures for accidental discovery of archaeological and paleontological resources as required for the proposed project. As with the proposed project, Alternative 4 would have no impact on historical architectural resources.

Visual Resources

Visual Resources impacts under Alternative 4 would be similar to those for the proposed project. Alternative 4 would result in the same significant and unavoidable permanent impact related to excavations at Borrow Area B, Hill 1000, and Observation Hill as identified for the proposed project. The significant and unavoidable temporary impact from construction activities would

also remain under Alternative 4, with the addition of temporary stockpiling of materials at Disposal Site 5. Disposal Site 5 is located in an area visible to travelers on Calaveras Road. Under this alternative, a stockpile of material would create a strong visual contrast with the surrounding landscape. This impact would be temporary, however, because Disposal Site 5 eventually would be filled with that material and inundated by the reservoir when it fills. After inundation, the remaining mound would create a lesser visual contrast with the surrounding landscape than the temporary stockpile. Alternative 4 would reduce the less-than-significant temporary construction impacts identified for the project because Disposal Site 7, visible from Calaveras Road, would remain unchanged from its current condition under this alternative. Impacts on visual resources would otherwise be the same as those described for the proposed project, and Alternative 4 would have similar overall impacts on visual resources.

Transportation and Circulation

Impacts would be similar to those of the proposed project. On-site truck traffic would increase and use the west haul route, but this would not affect traffic safety on Calaveras Road. Under Alternative 4, a significant and unavoidable impact would occur if Alameda County would not permit the temporary closure of Calaveras Road, similar to the proposed project.

Air Quality

Overall, Alternative 4 would have increased air quality impacts compared to those of the proposed project. Alternative 4 would generate more air pollution from vehicle and heavy equipment within the project area because truck trips and ground disturbance in Disposal Site 7 on the eastern side of the reservoir would be replaced with longer haul trips to Disposal Site 5 at the south end of the reservoir, stockpiling, and additional handling of the disposal materials. Implementation of the mitigation measures identified for the proposed project in Chapter 5 would reduce these impacts to less-than-significant levels.

Off-site traffic related to construction would be the same as that identified for the proposed project. Diesel PM emissions along Calaveras Road, therefore, would be the same under this alternative. As under the proposed project, air quality impacts related to operation and maintenance would be unchanged compared with existing conditions.

The proposed project would need to reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD thresholds. This level of reduction is not likely to be achieved even with mitigation, resulting in a significant and unavoidable air quality impact during construction for the proposed project. Alternative 4 would have even greater emissions than the proposed project, requiring an even higher level of reduction to be below the BAAQMD thresholds. Even with implementation of mitigation (such as controls for fugitive dust, exhaust, and NOA), emissions for Alternative 4

would likely exceed the BAAQMD draft significance thresholds and would result in a significant and unavoidable impact, like the proposed project.

Noise and Vibration

Traffic-generated noise levels from off-site hauling of materials for dam construction would be increased compared to the proposed project. Construction-generated noise would increase in the vicinity of Disposal Site 5 (Borrow Area E) due to additional truck traffic and decrease in the vicinity of proposed Disposal Site 7. Significant and unavoidable impacts of nighttime construction activities at Disposal Site 5 would remain and increase by 6 months under this alternative because of back-up beepers from construction equipment. While mitigation could partly reduce effects, the nighttime construction noise impact would be significant and unavoidable. As under the proposed project, long-term disturbances related to operations would be less than significant.

Utilities, Service Systems, and Public Services

Impacts would be similar to those of the proposed project due to the similar nature of construction. Utilities, service systems, and public services impacts would be less than significant. The alternative would not increase the demand for fire/police protection, schools, parks, or other services.

Mineral and Energy Resources

Mineral and energy resources impacts would be increased compared to those of the proposed project. A longer haul route would be needed for disposing of earth and rockfill materials from the dam construction site and borrow areas near the dam site at Disposal Site 5 rather than at Disposal Site 7. As a result, Alternative 4 would consume approximately 180,000 more gallons of fuel than the proposed project (URS 2008).² This alternative would also use additional fuel related to the double handling of the spoils. As with the proposed project, this temporary increase in energy use during construction would be less than significant with mitigation. Exhaust control measures would minimize inefficient or wasteful use of fuel. Operations would be the same as under the proposed project and would have no impact on energy resources. Impacts on mineral resources would be the same as those of the proposed project because Alternative 4 would use the same amount of materials from the same sources.

² An evaluation prepared by URS for the SFPUC considered a similar alternative that would increase use of Disposal Site 5 rather than Disposal Site 3 and found the increased amount of fuel needed to be on the order of 180,000 gallons compared to the proposed project (URS 2008). A change from use of Disposal Site 7 to Disposal Site 5 would involve a similar increase.

7.6.4 CONCLUSION

Most of the impacts of Alternative 4 would be the same as those of the proposed project. The alternative would avoid impacts on upland dispersal habitat for California tiger salamander and California red-legged frog and aquatic habitat at Disposal Site 7. While avoiding effects on biological resources at Disposal Site 7, this alternative would have increased impacts related to noise (significant and unavoidable under the proposed project), air quality, and fuel consumption. Visual impacts would be similar to the proposed project and significant and unavoidable. This alternative would increase on-site truck trips, but this would not change the significant and unavoidable traffic safety impact associated with haul truck traffic on Calaveras Road under the proposed project if Alameda County does not permit temporary road closure. Alternative 4 would increase cost and construction duration compared to the proposed project due to the longer haul route and double handling of material at Disposal Site 5. The alternative would meet all project objectives.

7.7 ALTERNATIVE 5, NEW DOWNSTREAM DAM WITHOUT PROVISION FOR POTENTIAL FUTURE ENLARGEMENT ALTERNATIVE

7.7.1 DESCRIPTION OF THE ALTERNATIVE

Alternative 5 differs from the proposed project in that it would consist of a replacement dam with a thinner core and narrower crest width that would not provide for potential future enlargement. This alternative would reduce the need for borrow material by approximately 11 percent and disposal materials by approximately 6 percent as compared to the proposed project and consequently would reduce construction-related impacts associated with the movement of soil materials. Under this alternative, and similar to the proposed project, the dam would be constructed downstream of the existing dam with an open channel spillway located on the left abutment. The construction period for this alternative would be approximately 4 months shorter than the construction period for the proposed project. This alternative would make use of and extend the existing outlet system, similar to the proposed project.

Similar to the proposed project, the landslide on the right abutment would require stabilization, both prior to dam foundation excavation and following the completion of embankment construction.

Since under this alternative the dam would not be designed to accommodate potential future enlargement, the core width and chimney filter thickness could be reduced, thus reducing the volume of excavation required to form the core trench. Excavation for this alternative would also be reduced because the upstream toe of the dam would be shifted downstream such that less of the existing dam would need to be removed to expose the dam foundation. These reductions in

excavation would result in approximately 230,000 cubic yards less material that would be disposed in Disposal Sites 3, a 6-percent reduction in the volume of disposed material.

Except for the width of the core and filter and drain zones, the dam footprint and upstream and downstream slopes would be the same as the proposed project. Under both Alternative 5 and the proposed project, approximately 945 linear feet of Calaveras Creek would be permanently affected by the dam footprint.

Table 7.8 identifies the differences in borrow material volumes and location between the proposed project and Alternative 5. The filter and drain material would be imported from off-site commercial sources for both the proposed project and this alternative, but the amount that must be imported for Alternative 5 would be less, as shown in Table 7.8. The amount of material excavated from Borrow Area E would be reduced. Borrow Area E would include the same area of disturbance; however, the excavation would not be as deep in some locations. Overall, this alternative would use about 11 percent less material as compared to the project.

Table 7.8: Comparison of Construction Source Materials for the Proposed Project and Alternative 5

Source of Material	Type of Material	Amount of Source Material (cubic yards)	
		Proposed Project	Alternative 5 ¹
Spillway excavation	Temblor Sandstone	1,470,000	1,470,000
Borrow Area B	Blueschist/greywacke	764,000	764,000
Borrow Area E	Alluvium	755,000	410,000
Imported filter and drain material	Sand and gravel	330,000	302,000
Total		3,319,000	2,946,000 ²
<i>Notes:</i> ¹ Quantities for Alternative 5 are approximate. ² This is an approximately 11-percent reduction compared to the proposed project.			

Sources: URS 2005a and URS 2005b

Table 7.9 identifies the differences in estimated disposal materials between the proposed project and Alternative 5. Disposed material volume would be the same as for the proposed project except for a reduction in the amount of material disposed of at Disposal Site 3. The footprint of Disposal Site 3 would be the same under the proposed project and Alternative 5.

Table 7.9: Estimated Disposal Quantities for the Proposed Project and Alternative 5

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 5 ¹
Disposal Site 2	470,000	470,000
Disposal Site 3	2,250,000	2,020,000
Disposal Site 5	Surplus disposal area	Surplus disposal area
Disposal Site 7	1,060,000	1,060,000
Total	3,780,000	3,550,000 ²
<i>Notes:</i> ¹ Quantities for Alternative 5 are approximate. ² This is an approximately 6-percent reduction from the proposed project.		

Source: URS 2005b

The key differences between this alternative and the proposed project are the reductions in the amounts of materials borrowed from Borrow Area E for the core zone, imported filter and drain materials, and disposal of materials at Disposal Site 3. Rockfill excavated from Borrow Area B would be similar for the proposed project and Alternative 5.

7.7.2 ABILITY TO MEET PROJECT OBJECTIVES

Alternative 5 would meet all project objectives except the objective to construct a new dam with a robust design that could accommodate potential enlargement by future generations.

7.7.3 IMPACTS OF THE ALTERNATIVE

The discussion below highlights the differences in impacts compared to the proposed project.

Land Use, Agricultural Resources, and Recreation

Overall, land use impacts would be similar to those of the proposed project. The slightly shorter construction duration (4 months less) would result in less disruption of grazing activities; as with the proposed project, the alternative would not significantly affect agricultural land uses. The reduction in construction duration and truck trips associated with importing filter and drain material would lessen the construction impact on established recreational uses, but this impact would remain less than significant with mitigation.

Vegetation and Wildlife

The area of habitat disturbance for construction, including borrow and disposal sites, would be the same for the proposed project and Alternative 5, resulting in similar impacts on wetlands and other aquatic habitats and special-status plants and animals. Implementation of avoidance

measures, including pre-construction and construction measures, as well as restoration and compensation measures, would reduce vegetation and wildlife impacts to less-than-significant levels.

Fisheries and Aquatic Habitat

Impacts on fisheries and aquatic habitat would not be substantially different from those under the proposed project. Although less material would be excavated from Borrow Area E and less material would be disposed of in Disposal Area 3 under Alternative 5, the potential impact on fisheries and aquatic habitat resources as a result of potential sediment discharge and exposure to contaminants would be essentially the same for Alternative 5 and the proposed project because the overall amount of material that would be handled at the site would be of a similar magnitude. Implementation of a SWPPP and measures for preventing water quality impacts from accidental discharges of drilling fluids would reduce this impact to a less-than-significant level. Operations impacts would also be the same under Alternative 5 as under the proposed project.

Hydrology

Hydrology impacts under Alternative 5 would be similar to those of the proposed project. The reduction in construction and disposal materials would have a negligible effect on construction-related impacts relative to the proposed project. Operations would be the same as under the proposed project and thus impacts on hydrology would be the same.

Water Quality

Impacts related to soil erosion and sediment discharge into waters, as well as the potential for spills of construction-related substances into waters, would be essentially the same as those identified for the proposed project. The reduction in excavation at Borrow Area E would marginally reduce the potential for soil erosion and sediment discharge in this area, but the overall amount of material that would be handled at the site would be of a similar magnitude, resulting in similar impacts. Implementation of a SWPPP and measures for preventing water quality impacts from accidental discharges of construction-related substances and drilling fluids would reduce this impact to a less-than-significant level. Operational effects on water quality would be the same as for the proposed project.

Geology, Soils, and Seismicity

Impacts would be similar to those identified for the proposed project due to the similar types of construction activities and amounts of material being disturbed. The reduction in material excavated from Borrow Area E and disposed of at Disposal Site 3 would not appreciably change geology-, soils-, and seismicity-related impacts.

Hazards and Hazardous Materials

Impacts would be similar to those identified for the proposed project due to the similar types of construction activities and amounts of material being disturbed. The reduction in material excavated from Borrow Area E and disposed of at Disposal Site 3 would not appreciably change hazards and hazardous materials impacts.

Cultural Resources

Cultural resources impacts under Alternative 5 would be similar to those of the proposed project. The potential impacts associated with cultural resources result mainly from excavations for the dam foundations and borrow areas, which are similar for this alternative and the proposed project. This alternative would require approximately 345,000 cubic yards less material from Borrow Area E, which is likely to reduce the depth of excavation required. This would reduce the potential for excavation to damage or destroy buried cultural resources at this location.

While Alternative 5 may reduce potential impacts compared to the proposed project, the impacts would remain less than significant after mitigation, and the same mitigation identified for the project – archaeological evaluation and monitoring, treatment of human remains, and measures for accidental discovery of archaeological and paleontological resources – would be required. As with the proposed project, Alternative 5 would have no impact on historical architectural resources.

Visual Resources

Visual resources impacts under Alternative 5 would be similar to the proposed project. This alternative would not change the permanent and temporary significant and unavoidable visual impacts identified for the proposed project. Visual impacts are primarily associated with excavation of the peak of Observation Hill and Hill 1000 (for the spillway), Borrow Area B, and construction staging in those areas. These activities would be the same under Alternative 5 as under the proposed project. The reduction in material placed at Disposal Site 3 under Alternative 5 would be insufficient to change the ultimate limits or contours of this area, and after completion the views toward Observation Hill would appear similar to views under the proposed project. Similarly, the areas of disturbance at Borrow Area E would be the same as with the proposed project, and the reduced volume of material excavated would not change visual impacts. All other impacts on visual resources would be the same as with the proposed project.

Transportation and Circulation

Under this alternative the total number of truck trips would be reduced compared to the proposed project, and the construction period would be reduced by 4 months compared to the proposed project. However, this reduction in on-site truck trips would not substantially affect traffic, and

Transportation and Circulation impacts would be similar to those for the proposed project. Hauling excavated materials to Disposal Site 3 and hauling core material from Borrow Area B would occur on-site and would not contribute to transportation and circulation impacts. Hauling of filter and drain materials from off site and from Borrow Area E would require fewer truck trips under this alternative compared to the proposed project.

Alternative 5 would reduce the number of haul truck trips areas as follows:

- Hauling excavated materials to Disposal Site 3 would be reduced from 94,600 to 84,900 trips.
- Hauling imported filter and drain materials from off site for the new dam would be reduced from 23,300 to 21,300 trips.
- Hauling core materials from Borrow Area E to the dam would be reduced from 38,100 to 20,700 trips.

Impacts of Alternative 5 related to reduction in roadway capacity, increased potential for traffic hazards during construction, and wear and tear on haul routes would be similar to those of the proposed project, although slightly shorter in duration. As with the project, these impacts would be less than significant with implementation of a traffic control plan. Despite the 4-month reduction of the construction period, the potentially significant and unavoidable traffic safety impact identified for the proposed project would remain if Alameda County does not permit the temporary closure of Calaveras Road. The increase in traffic delays would also be slightly shorter in duration, although this impact would remain less than significant, as under the proposed project.

Air Quality

The reduction in on-site and off-site truck trips and construction duration would reduce construction-related air quality impacts. Generation of temporary, construction-related emissions and exposure of sensitive receptors to short-term project-generated emissions of diesel PM would remain significant and require mitigation under this alternative. Air quality impacts would be reduced to less than significant with implementation of fugitive dust control and diesel particulate matter reduction measures, as with the proposed project.

The proposed project would need to reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD thresholds. This level of reduction is not likely to be achieved even with mitigation, resulting in a significant and unavoidable air quality impact during construction for the proposed project. Alternative 5 would have fewer emissions than the proposed project because it would involve less excavation and disposal of materials and a slightly shorter construction period. However, even with implementation of mitigation (such as controls for fugitive dust, exhaust, and NO_x), emissions for this alternative would likely exceed the BAAQMD draft significance thresholds. Therefore, although Alternative 5 would have reduced air quality impacts relative to the proposed

project, the impacts would still result in a significant and unavoidable impact, like the proposed project.

Noise and Vibration

Overall, the noise and vibration impacts of this alternative would be similar to those of the proposed project. The 4 month shorter construction duration due to excavation and disposal of less material would only marginally reduce the construction-related noise impacts. The level of activity in Borrow Area E would be reduced due to the reduction in the volume of material that would be excavated. The duration of the activity in Borrow Area E during dam construction would be reduced from about 11 months to 9 months. Blasting would occur for the excavation of the dam foundation and the spillway and in Borrow Area B under this alternative, as with the proposed project. This alternative would reduce the duration of noise impacts on sensitive receptors near the southern boundary by 2 months. Although the number of trucks trips for hauling core material would be reduced, even with the implementation of noise controls, the noise impact would still be considered significant and unavoidable due to back-up safety beepers. Disturbances related to long-term operations would remain less than significant.

Utilities, Service Systems, and Public Services

Impacts under Alternative 5 would be similar to those under the proposed project due to the similar nature of project construction. All impacts on utilities, service systems, and public services would be less than significant.

Mineral and Energy Resources

Impacts on mineral resources would be reduced because of the less robust dam design, which would require importation of less material from off-site. Alternative 5 would result in less consumption of fuel due to the reduction in truck trips. Implementation of exhaust control measures, such as limiting idling and performing low-emissions tune-up, would reduce the impact of energy use. Operations under Alternative 5 would be the same as under the proposed project and would have no impact on energy resources.

7.7.4 CONCLUSION

This alternative would have impacts similar to those of the project for most resources, but certain construction-related impacts would be reduced because this alternative would require the movement of about 11 percent less material for construction and about 6 percent less material for disposal, as compared to the project. Impacts associated with the movement of material that would be reduced include impacts on air quality, transportation, noise, and cultural resources as well as impacts on water quality and fisheries and aquatic resources associated with sediment discharge and erosion. All impacts could be avoided or reduced with the same mitigation

measures as identified for the project. Although this alternative would reduce the duration of the noise impact on sensitive receptors at Borrow Area E by 2 months, this impact would remain significant and unavoidable.

This alternative would satisfy all project objectives except for the objective to construct a new dam with a robust design that could accommodate potential enlargement by future generations.

7.8 ALTERNATIVE 6, REPLACEMENT DAM AT EXISTING LOCATION ALTERNATIVE

7.8.1 DESCRIPTION OF THE ALTERNATIVE

Alternative 6 differs from the proposed project primarily in two ways: (1) the alternative dam would be located in the footprint of the existing dam, rather than immediately downstream as with the proposed project; and (2) the alternative would reuse the existing spillway and thereby avoid a cut slope on Observation Hill and Hill 1000. This alternative was identified in order to examine options for lessening or avoiding significant impacts of the proposed project, including visual resource and biological resource impacts. The proposed project would use the existing dam as a cofferdam during construction. Alternative 6 would require construction of a cofferdam immediately upstream of the existing dam, in the reservoir. The cofferdam is assumed to be of cellular sheetpile construction to an estimated elevation of 665 feet (NGVD 29 datum). To protect the construction area for the replacement Calaveras Dam, the cofferdam must bypass flow, including 100-year flood events. Bypassing of flow would require reopening and rehabilitating a decommissioned 19.5-foot-diameter tunnel that is located underneath the existing Calaveras Dam. A second, shorter sheetpile wall would be required downstream of the cofferdam and adjacent to the upstream tunnel opening to protect the area of the tunnel opening from peak flows. Previous analysis of such a cofferdam and bypass tunnel identified significant challenges regarding the constructability of such features and their feasibility remains uncertain at this time (URS 2005b and SFPUC 2004). Dredging, underwater construction, and pile driving would be required for this alternative.

Unlike the proposed project, this alternative would allow the reuse of the existing open channel spillway alignment located on the left abutment of the existing dam. The spillway would likely require some reconstruction to pass the design flood.

Similar to the proposed project, this alternative would make use of the existing outlet system where possible and modify the outlet works where necessary. This alternative would also require stabilization of the landslide downstream of the right abutment of the existing dam, as is required for the proposed project. Because the topography of the left abutment at the existing dam site is lower than at the proposed project site, it would not be feasible to construct a dam at this location

with provision for potential future enlargement without extensive removal and demolition. As such, the core width and chimney filter thickness could be reduced, as detailed in Alternative 5.

Table 7.10 identifies the differences in borrow material volumes and borrow locations between the proposed project and Alternative 6. As with the proposed project, the filter and drain material would be imported from off-site commercial sources.

Table 7.10: Comparison of Construction Source Materials the Proposed Project and Alternative 6

Source of Material	Type of Material	Amount of Source Material (cubic yards)	
		Proposed Project	Alternative 6 ¹
Spillway excavation	Temblor Sandstone	1,470,000	Not applicable
Existing dam	Existing earthfill	Not applicable	1,300,000
Borrow Area B	Blueschist/greywacke	764,000	985,000
Borrow Area E	Clay alluvium	755,000	490,000
Imported filter and drain material	Sand and gravel	330,000	350,000
Total		3,319,000	3,125,000 ²
<i>Notes:</i> ¹ Quantities for Alternative 6 are approximate. ² This is approximately a 6-percent reduction compared to the proposed project.			

Sources: URS 2005a and URS 2005b

Although Alternative 6 would use about 6 percent less volume of materials than the proposed project, it would use more materials than Alternative 5. This is because the axis for a dam at the existing dam location is longer than would be required at the location immediately downstream. Although Alternative 6 would use less material overall than the proposed project, more rock would be required from Borrow Area B under this alternative to replace rock that would come from excavation for the new stilling basin under the proposed project.

Table 7.11 identifies the differences in estimated disposal quantities between the proposed project and Alternative 6. The volume of surplus rock and soil produced under Alternative 6 would increase by 6 percent due to removal of the entire existing dam, including the upstream and downstream faces and previously completed buttresses. Under the proposed project, only a portion of the existing dam would be removed. As indicated in Table 7.11, Disposal Site 2, located between the proposed project and the existing dam, would not exist under Alternative 6. Disposal Site 5 would be needed due to the larger volume of material that would need to be disposed and the elimination of Disposal Site 2.

Table 7.11: Estimated Disposal Quantities for the Proposed Project and Alternative 6

	Disposal Quantity (cubic yards)	
	Proposed Project	Alternative 6 ¹
Disposal Site 2	470,000	Eliminated
Disposal Site 3	2,250,000	2,250,000
Disposal Site 5	Reserve disposal area	690,000
Disposal Site 7	1,060,000	1,060,000
Total	3,780,000	4,000,000 ²
<i>Notes:</i> ¹ Quantities for Alternative 6 are approximate. ² This is an approximately 6-percent increase compared to the proposed project.		

Source: URS 2005b

Since this alternative would require construction of an upstream cofferdam of reduced height (in comparison to the use of the existing dam as a cofferdam under the proposed project), the level of the reservoir during the 4-year construction period following completion of construction of the cofferdam would be reduced to a nominal storage of approximately 8,500 acre-feet (in comparison to 34,400 acre-feet under the proposed project) and all flows would be bypassed. Flows originating in Alameda Creek would be bypassed at the ACDD (with no diversion to the reservoir) and flows originating in Arroyo Hondo and Calaveras Creek upstream of the reservoir would be released through the cofferdam bypass tunnel. Due to the small capacity of the drawdown reservoir, combined with any potential water quality issues from such a low reservoir level, storage and yield during construction would be effectively eliminated. For this reason, the water storage and supply functions of Calaveras Reservoir would be restricted during construction under this alternative.

The overall construction period for this alternative would be approximately 1 year longer than under the proposed alternative due to construction of the cofferdam, for a total of 5 years.

7.8.2 ABILITY TO MEET PROJECT OBJECTIVES

This alternative would meet the project objectives of re-establishing water delivery reliability, restoring water supply and reservoir capacity, and improving seismic reliability. However, as stated above, re-using the location of the existing dam would significantly restrict any potential future enlargement because of the lower elevation of the existing topography at the left abutment in comparison to the higher topography available at the proposed project site immediately downstream. For this reason, this alternative would not achieve the project objective of a dam design that would allow potential future enlargement of the dam and reservoir through reuse of dam components and without extensive removal and demolition. Furthermore, this alternative

would not satisfy the secondary project objective of continuing the reservoir and outlet works operation during construction. Alternative 6 would only partially satisfy the secondary objective of maintaining high water quality by keeping water temperatures cooler and limiting algal growth in the reservoir, as the alternative would cause significant water quality impacts in the reservoir during construction.

7.8.3 IMPACT OF THE ALTERNATIVE

The discussion below highlights the differences in impacts compared to the proposed project.

Land Use, Agricultural Resources, and Recreation

Land use impacts would be less than significant than and similar to those of the proposed project. The change in dam location and slight change in project footprint would not substantially alter the existing character in the vicinity or change surrounding land uses. This alternative would result in less disruption of grazing activities during construction due to the reduced project footprint. Like the proposed project, it would not significantly affect agricultural uses. Although the duration of construction is longer, the first year of construction would not involve much traffic on roadways that would affect recreational access. Overall, impacts to land use, agricultural resources, and recreation are similar to the proposed project.

Vegetation and Wildlife

Construction impacts on vegetation and wildlife would be increased compared to the proposed project because of the construction of the cofferdam and subsequent reservoir drawdown. Although reusing the existing dam site would reduce the loss of riparian habitat downstream, drawdown of the reservoir during construction could affect terrestrial species access to the water, reduce aquatic and wetland habitats, affect water quality, and cause loss of food supply/prey. These temporary construction impacts would be greater than the proposed project, potentially significant and require mitigation. Borrow and disposal impacts on vegetation and wildlife would be similar to those of the proposed project (i.e., less than significant with mitigation). The alternative would require about 6 percent less borrow material but would generate about 6 percent more material requiring disposal. Less than significant proposed project impacts associated with long-term loss of wetland and aquatic habitat impacts in Calaveras Creek would be reduced by eliminating the new dam footprint and inundation area downstream under this alternative.

Fisheries and Aquatic Habitat

Construction impacts on fisheries and aquatic habitat in the reservoir would be substantially increased compared to the proposed project. Under this alternative, the reservoir would be largely emptied; therefore, the resident fishery population (including the resident rainbow trout population) could be effectively eliminated. The habitat quality of the remaining pool would be

marginal, particularly during the summer when water temperature would rise and the concentration of dissolved oxygen in water would decline.

Mitigation actions would be taken to lessen the severity of the impact. However, the construction impacts on fish populations and aquatic habitat in the existing reservoir would be significant and unavoidable. Installation of the cofferdam would result in noise and vibration which could injure fish. Temporary effects on fish related to increases in sediments and turbidity and the release of and exposure to contaminants would be increased due to the excavation and disposal of additional materials and the construction of the cofferdam within the existing reservoir. The reservoir drawdown would lower the reservoir below the California Department of Fish and Game minimum pool elevation of 690 feet. In addition, the existing reservoir elevation creates conditions that limit hydrologic connectivity between the reservoir and Arroyo Hondo. This creates adverse migration conditions for rainbow trout that move between the reservoir and Arroyo Hondo to spawn. An increased drawdown of the reservoir during construction would exacerbate this already limited condition for fish migration/movement.

Because the reservoir would not be operational during construction, flows would be bypassed. Flows originating in Alameda Creek would be bypassed at the ACDD (with no diversion to the reservoir) resulting in increased water in this segment of Alameda Creek; flows originating in Arroyo Hondo and Calaveras Creek upstream of the reservoir would be released through the cofferdam bypass tunnel resulting in increased water in Calaveras Creek downstream of the existing dam. This would be a potential short-term benefit to downstream habitat and fisheries. Because of the greater drawdown of the reservoir, it would take longer to refill and establish a cold-water pool and enable 1997 MOU releases to support downstream fisheries. Operations once the reservoir is refilled would be the same as under the proposed project.

Hydrology

Because of the new cofferdam and the substantial drawdown of the reservoir, construction effects of this alternative would be somewhat different from those of the proposed project. However, the magnitude of impacts would be similar to those for the proposed project. Drawdown of the reservoir and bypassing of flows during construction would temporarily increase flow rates in Calaveras and Alameda Creeks downstream of Calaveras Dam. The reservoir would be maintained at a lower level than under the proposed project for 4 years during construction after the coffer dam is in place. Following construction, the reservoir would require additional time to fill to its restored operating level compared to the proposed project. While different from the proposed project, the flows during construction and refilling are anticipated to be within the historical range of conditions on the two creeks and would have less-than-significant impacts.

Construction effects on groundwater would be similar to those of the proposed project and would be less than significant. The risk of downstream flooding would remain less than significant.

The reservoir would be substantially drawn down during construction, and a bypass tunnel would be rehabilitated to allow the cofferdam to bypass up to 100-year flood events. Operational impacts on hydrology, once the reservoir is refilled, would be the same as those of the proposed project and less than significant.

Water Quality

Water quality impacts in the reservoir during construction would be significantly increased compared to those of the proposed project. The construction of the cofferdam would increase sediment discharges during construction. The drawdown of the reservoir to 8,500 acre-feet would result in increased water temperatures and decreased dissolved oxygen, particularly during warmer months.

Water quality effects related to disturbance of NOA-containing materials would be the same as those of the proposed project because a similar volume of NOA and metals containing materials would be moved under this alternative. Changes in water quality in Calaveras Reservoir during future operation and restoration of pre-DSOD-restricted reservoir conditions would remain the same as under the proposed project and beneficial. Changes in water quality in Calaveras and Alameda Creeks during future operation would remain less than significant.

Geology, Soils, and Seismicity

Overall, impacts would be similar to those of the proposed project. Like the proposed project, this alternative would beneficially reduce seismic hazards. Impacts related to excavation and construction of the replacement dam, including landslides and erosion and impacts from expansive and corrosive soils, would remain as described in Section 4.8, Geology, Soils, and Seismicity. This alternative would involve excavation and disposal of approximately 6 percent more material than the proposed project. It would use Disposal Site 5 since Disposal Site 2 (the excavated area between the existing dam and new dam) would not exist. Depending on actual quantities produced during construction, a portion of the materials disposed at Disposal Site 5 may need to be mounded above grade. As with the proposed project, these impacts would be less than significant with mitigation that would address design of excavation and disposal sites and placement of fill.

Hazards and Hazardous Materials

Impacts related to releases of NOA would be similar to those of the proposed project (less than significant with mitigation). About the same amount of NOA-containing materials would be disturbed under this alternative as compared to the proposed project. The amount of rockfill required from Borrow Area B would be greater for this alternative than for the proposed project; however, this would not substantially increase the impact associated with NOA. More NOA-containing materials would also be excavated from the dam foundation for this alternative

because more Franciscan Formation (which contains NOA) underlies this site than the proposed project site located downstream. The proposed project, however, would disturb Franciscan Formation in the excavation for the spillway stilling basin, whereas this alternative would use the existing spillway. Therefore, overall disturbance of NOA-containing material under the two alternatives would be roughly equivalent. Other impacts of Alternative 6 would be the same as those identified for the proposed project in Section 4.9, Hazards and Hazardous Materials.

Cultural Resources

Cultural resources impacts under Alternative 6 would be similar to those of the proposed project. The potential impacts associated with cultural resources result mainly from excavations for the dam foundations and borrow areas. This alternative would require approximately 265,000 cubic yards less material from Borrow Area E, which includes portions of an area of known archaeological resources. The amount of material excavated from Borrow Area E would decrease by about 6 percent, which could slightly change the depth of excavation and therefore decrease the potential for impacts to buried cultural resources. This decrease would be small. The potential for impacts to buried cultural resources at downstream dam site would be eliminated, while a potential impact would be introduced at the new coffer dam site. Overall affects of the alternative would be similar to the proposed project.

Impacts would be less than significant with the same mitigation (addressing archaeological evaluation and monitoring, treatment of human remains, and accidental discovery of archaeological and paleontological resources) as required for the proposed project. As with the proposed project, Alternative 6 would have no impact on historical architectural resources.

Visual Resources

Overall, visual resources impacts under Alternative 6 would be decreased compared to those of the proposed project. This alternative would reduce, but not eliminate, the permanent and temporary significant and unavoidable visual impacts identified for the proposed project. Under this alternative, the existing spillway would be used, avoiding an excavation into Observation Hill for the new spillway and excavation into Hill 1000 for the new stilling basin that would be part of the proposed project. However, excavation Borrow Area B would slightly increase compared to the proposed project, and the significant and the permanent unavoidable impact would remain. Other construction activities would create large areas of disturbance and removal of the cover of oak woodland vegetation, causing a temporary but significant and unavoidable impact similar to the proposed project. Other impacts on visual resources would be similar to those of the proposed project.

Transportation and Circulation

This alternative would have transportation and circulation impacts similar to those of the proposed project. Under this alternative, the total number of truck trips would be increased compared to the proposed project and the construction period would be increased by 1 year compared to the proposed project, but this would not change transportation impacts. Similar to the proposed project, hauling excavated materials to the disposal sites and hauling core material from Borrow Area E and rockfill from Borrow Area B would be on-site and would not contribute to transportation and circulation impacts. Hauling of filter and drain materials from off-site would require slightly more truck trips under this alternative compared to the proposed project.

Alternative 6 would result in an overall increase in haul truck trips as follows:

- Hauling excavated materials to Disposal Sites 3 and 7 would be unchanged and an additional 34,800 trips would be required to haul excavated materials to Disposal Site 5.
- Hauling imported filter and drain materials from off site for the new dam would require an increase from 23,300 to 24,700 trips.
- Hauling rockfill materials from Borrow Area B to the dam would require an increase from 34,500 to 44,500 trips.
- Hauling core materials from Borrow Area E to the dam would reduce truck trips from 38,100 to 24,700 trips.

Compared to the proposed project, this alternative would have similar impacts related to reduction in roadway capacity, increased potential for traffic hazards during construction, and wear and tear on haul routes. These impacts would be less than significant with implementation of a traffic control plan. Although the duration of construction is longer, the first year of construction would not involve much traffic on roadways that would affect transportation and circulation. This alternative would increase truck trips, but this would not change the significant and unavoidable traffic safety impact associated with haul truck traffic on Calaveras Road under the proposed project if Alameda County does not permit temporary road closure. Impacts related to increased traffic delays would also be similar, and would remain less than significant.

Air Quality

The increase in truck trips and construction duration would increase construction-related air quality impacts. Generation of temporary, construction-related emissions would remain significant and require mitigation under Alternative 6. Project construction-related activities would generate temporary emissions of criteria air pollutants and ozone precursors from motorized vehicles and heavy equipment. Alternative 6 would increase ground disturbance and materials transport in the project area and the related fugitive PM₁₀ dust emissions. The mitigation measures identified for the project in Chapter 5 would be necessary to avoid significant air quality impacts. Ground disturbance and material transport could also result in generation of airborne NOA; as with fugitive PM₁₀, the mitigation measures for fugitive dust and

exhaust emissions identified for the proposed project in Chapter 5 would be necessary and would reduce airborne NOA to less-than-significant levels. As under the proposed project, operation and maintenance activities would be unchanged relative to existing conditions.

The proposed project would need to reduce emissions of ROG, NO_x, PM₁₀, and PM_{2.5} by 35 percent, 89 percent, 98.5 percent, and 98.2 percent, respectively, to be below the draft BAAQMD thresholds. This level of reduction is not likely to be achieved even with mitigation, resulting in a significant and unavoidable air quality impact during construction for the proposed project. Alternative 2 would have even greater emissions than the proposed project, requiring an even higher level of reduction to be below the BAAQMD thresholds. Even with implementation of mitigation (such as controls for fugitive dust, exhaust, and NOA), emissions for Alternative 6 would likely exceed the BAAQMD draft significance thresholds and would result in a significant and unavoidable impact, like the proposed project.

Noise and Vibration

Temporary construction-related noise and vibration in the area surrounding the dam would remain essentially the same as described for the proposed project in Section 4.14, Noise and Vibration. Compared to the proposed project, the level of borrow activity in Borrow Area E would be slightly reduced due to the reduction in the volume of clay material that would be excavated. The duration of the activity in Borrow Area E would be reduced from about 11 months to 10 months, but the significant and unavoidable impact from nighttime back-up beepers would remain. This alternative would require the use of Disposal Site 5, which could increase noise impacts on sensitive receptors near the southern end of the reservoir. Blasting would occur in Borrow Area B under this alternative, as with the proposed project. Disturbances related to long-term operations would remain less than significant.

Utilities, Service Systems, and Public Services

Impacts under Alternative 6 would be similar to those of the proposed project. The 1-year increase in construction duration and slight differences in construction activities and locations within the project site would not appreciably change the less-than-significant impacts on demand for fire protection, law enforcement services, landfill capacity, or electrical transmission lines to Calaveras Dam and related structures identified for the proposed project in Section 4.15, Utilities, Service Systems, and Public Services.

Mineral and Energy Resources

Overall, Alternative 6 would increase minerals and energy impacts due to greater fuel consumption. Impacts on mineral resources would be slightly reduced due to decreased material requirements for the replacement dam. Alternative 6 would require about 6 percent less material to construct the dam and would not change the less-than-significant impact on mineral resources

identified for the proposed project. Compared to the proposed project, Alternative 6 would consume more fuel due to the increase in truck trips and construction duration. However, this increase would not change the less-than-significant impact with mitigation finding identified for the project in Section 4.16, Mineral and Energy Resources. Operations would be the same as under the proposed project and would have no impact on energy resources. Overall, impacts on mineral and energy resources would be increased compared to the proposed project due to the substantial increase in fuel consumption.

7.8.4 CONCLUSION

By reusing the location of the existing dam, Alternative 6 would reduce some of the proposed project's less-than-significant impacts on habitat and wetlands downstream of the existing dam. However, it would cause new and potentially significant impacts on fisheries, wildlife, and water quality as a result of construction of a cofferdam within the existing reservoir and substantial drawdown of the reservoir during construction. It would require about 6 percent less material to construct, but would generate about 6 percent more material for disposal. Other construction-related impacts would be similar to those of the proposed project. Operational impacts would be identical to those of the proposed project, once the reservoir was refilled.

The alternative would meet the project objectives related to restoring water supply but would not meet the primary project objective to allow potential enlargement by future generations or the secondary project objective to continue operation of reservoir and outlet works during construction. It would only partially meet the secondary objective of maintaining high water quality, as reservoir water quality during construction would be significantly impacted. Alternative 6 would also increase the cost and duration of construction compared to the proposed project.

7.9 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

CEQA requires the identification of an environmentally superior alternative among the proposed project and the set of alternatives evaluated. The State CEQA Guidelines further state that if the No Project Alternative is the environmentally superior alternative, then the EIR must also identify which of the action alternatives is the environmentally superior alternative.

In this case, the No Project Alternative is not the environmentally superior alternative. The No Project Alternative would involve substantial construction to lower the existing dam's spillway. The No Project Alternative would reduce impacts on vegetation and wildlife, transportation, air quality, and noise due to the smaller scale and duration of construction, but impacts on visual resources and geology, soils, and seismicity would remain. The No Project Alternative would reduce, but not avoid, the significant and unavoidable impacts on visual resources and air quality associated with the proposed project and would eliminate the significant and unavoidable noise impact from nighttime construction. However, the No Project Alternative would leave the

SFPUC and its customers at significant risk of supply reduction or disruption during an earthquake or other emergency, or during a drought. Under the No Project Alternative, the SFPUC, the Bay Area Water Supply and Conservation Agency, and/or wholesale customers might have to construct and operate additional facilities in order to develop supplemental surface water supplies, recycled water, or groundwater. Required facilities could include new treatment plants, storage and transmission facilities, and groundwater wells. Because the No Project Alternative would not avoid all significant and unavoidable environmental impacts of the CDRP, might result in additional impacts due to the need for supplemental supply development and associated facility construction, and would not meet the primary project objectives, it is not considered the environmentally superior alternative.

Alternative 5, New Downstream Dam without Provision for Potential Future Enlargement Alternative, is considered to be the environmentally superior alternative. Alternative 5 would reduce some construction-related impacts of the proposed project due to the approximately 11 percent less material required to construct it, and is the only alternative that would not result in new or increased significant impacts. It would meet most of the CDRP's objectives. It would not meet the primary objective of constructing a new dam with a robust design that could accommodate potential enlargement by future generations.

While some of the other alternatives would avoid or lessen certain project impacts, they would also result in substantial additional impacts that the project would not generate. Alternative 2, Off-Site Disposal, would not disturb Disposal Sites 3, 5, or 7, reducing impacts on vegetation and wildlife; fisheries and aquatic habitat; water quality, and cultural resources. However, off-site disposal would generate a large increase in truck trips, thereby increasing impacts on recreation, transportation and circulation, and air quality. Similarly, Alternative 3, Off-Site Borrow, would reduce impacts on vegetation and wildlife, fisheries and aquatic habitat, water quality, hazards and hazardous materials, cultural resources; and noise and vibration associated with Borrow Areas B and E, but the large increase in truck trips to transport construction source materials would increase impacts on recreation, transportation and circulation, and air quality. Alternative 4, Consolidated On-Site Disposal, would avoid impacts on vegetation and wildlife at Disposal Site 7, but increase other impacts on vegetation and wildlife, water quality, air quality, and noise and vibration due to materials double-handling and increased hauling distance to Disposal Site 5. Alternative 6, Replacement Dam at Existing Location, would reduce but not eliminate the project's significant and unavoidable visual resources impacts by reusing the existing spillway and avoiding excavation at Observation Hill. However, this alternative would substantially increase impacts on vegetation and wildlife, fisheries and aquatic habitat, water quality, and air quality as a result of constructing a new cofferdam in the existing reservoir and drawing the reservoir down substantially during construction.

7.10 ALTERNATIVES CONSIDERED AND REJECTED

CEQA requires an EIR to describe a range of reasonable alternatives to the project or to the location of the project that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project. A fundamental purpose of the proposed project is to restore an existing dam to its previous function in order to provide a level of water storage from local watershed resources consistent with historical storage levels prior to DSOD-imposed restrictions, improving drought reliability.

Accordingly, the SFPUC considered several alternative storage locations potentially capable of providing water storage capacity equivalent to the restored Calaveras Reservoir. However, for various reasons, including institutional and regulatory constraints, cost, technical practicability, and environmental effects, none satisfied the CEQA requirements for feasibility.

During public scoping for the CDRP, commenters raised the possibility of constructing a larger dam for a larger reservoir. This alternative is also discussed briefly below and reasons for rejecting that alternative are provided.

7.10.1 ALTERNATIVE LOCATIONS FOR WATER STORAGE

Three alternative water storage locations were considered:

- Use of alternative storage locations in the SFPUC's Upper Tuolumne River system or in non-SFPUC facilities in the San Francisco Bay Area,
- Use of other SFPUC facilities in the Bay Area as alternative storage locations, and
- Use of alternative storage facilities in the Sunol Valley area.

The first alternative would require new or additional water supply in addition to increased storage capacity. The second two would create storage for Alameda Creek watershed supply. Each of these is discussed in greater detail below.

Alternative Locations for Water Storage in SFPUC's Upper Tuolumne River System or in Non-SFPUC Bay Area Facilities

Description of the Alternative

One of the alternatives considered and rejected was to replace most of the storage capacity of Calaveras Reservoir with increased storage capacity and additional water supply in the SFPUC Upper Tuolumne River system or in non-SFPUC Bay Area facilities. Potential options for non-SFPUC facilities could include expansion or revised operation of Del Valle Reservoir, Los Vaqueros Reservoir, or Lexington Reservoir.

This approach would require new water supplies or water rights to replace lost supply from the Calaveras and Alameda Creek watersheds, and construction of new facilities to store and distribute the water. If Calaveras Reservoir were to remain at its current reduced level, the spillway would need to be lowered, as under the No Project Alternative, with the same impacts as described for that alternative.

Compared to the proposed project, these alternative locations would entail substantial environmental impacts in new locations and potentially greater impacts than those associated with the proposed project. Alternative water sources would need to be obtained, with secondary impacts similar to those discussed under the No Project Alternative.

Reasons for Rejecting the Alternative

Storage in any of these locations would not meet the project objectives or the WSIP program objectives related to using water from the Alameda and Calaveras Creek watersheds for drought protection, re-establishing water delivery reliability, and limiting rationing to no more than 20 percent during droughts. For these reasons, this alternative was rejected from further consideration.

Alternative Locations for Water Storage in SFPUC Facilities in the Bay Area

Description of the Alternative

This alternative would use storage locations within the SFPUC system in the San Francisco Bay Area to replace the storage proposed for the Calaveras Reservoir, and Calaveras Dam could either continue its current operations or it could be removed. New or enlarged piping and pumping systems would be necessary to collect water from Alameda and Calaveras Creeks for storage at the alternative locations. Calaveras Reservoir could either remain at its current level, with modification of the spillway as described for the No Project Alternative, or the dam could be removed entirely.

Three alternative storage locations were considered: the San Antonio Reservoir, located in the Alameda Creek watershed to the north of the Calaveras Reservoir, and the Crystal Springs/San Andreas Reservoirs and Pilarcitos Reservoir, located on the San Francisco Peninsula. These sites are available only in the sense that they are located on CCSF land and are owned and operated by the SFPUC. None of these reservoirs has sufficient reserve capacity to individually accommodate increased storage equivalent to the volume that would be available in the Calaveras Reservoir with the proposed project. Thus, an increase in storage capacity would be required; all or most of the dams for these reservoirs would need to be raised to accommodate the additional storage needed (EDAW 2007).

In addition to raising the existing dams, it is also possible that the water treatment facilities at the Harry Tracy Water Treatment Plant on the Peninsula would need to be enlarged. This is because the Sunol Valley Water Treatment Plant that treats water from Calaveras Reservoir could treat any additional water stored in the San Antonio Reservoir but would not be available to treat the portion of the additional water that would be stored on the Peninsula under this alternative.

Raising the dams at the San Antonio Reservoir and on the Peninsula, and possibly expanding the Harry Tracy Water Treatment Plant, would result in substantial impacts on important biological resources. Therefore, reduced impacts on biological resources in the vicinity of the Calaveras Reservoir and Calaveras Creek would be exchanged for increased impacts on biological resources in the alternative storage locations. Construction-related water quality, traffic, and air quality impacts would also result, but in different locations from those identified for the proposed project.

Water from Alameda and Calaveras Creeks would need to be pumped directly from the creeks to the new storage locations, requiring construction of many miles of new pipes and possibly one or more new pump stations. These construction activities would be expected to have temporary but potentially significant impacts on transportation, air quality, noise, and biological resources, depending on alignments chosen for the new pipelines and pump stations. Recreational opportunities would be temporarily curtailed during construction at the Peninsula reservoirs.

Significant impacts on visual resources under the CDRP would differ from those of the project but would not be eliminated if the Calaveras Dam were removed, because removal of the dam would leave a large bare and rocky area and the sides of the former reservoir would be exposed. Revegetation would occur in some of the exposed areas over many decades. Visual impacts would be reduced because Hill 1000 would remain, but they would not be eliminated if the existing dam and reservoir were to remain, as described for the No Project Alternative because a substantially lower cut would need to be made in Observation Hill to accommodate the lowered spillway.

Reasons for Rejecting the Alternative

This alternative would meet most of the objectives of the proposed project, including providing for water delivery reliability during drought conditions and improving seismic reliability. It would not meet the objective of construction a new dam with a robust design that could accommodate enlargement by future generations. The alternative was rejected from further consideration because it would not avoid or substantially reduce environmental impacts as compared to the proposed project and could result in greater impacts on some resources.

Alternative Water Storage Facilities in the Sunol Valley Area

Description of the Alternative

This alternative would maintain the existing water level in the Calaveras Reservoir, as with the No Project Alternative, and would use different storage facilities in the Sunol region for the remaining water supply from the Alameda Creek watershed. The spillway crest would be lowered from the existing Elevation 756 feet to 705 feet, as with the No Project Alternative. Inflow to the reservoir from Calaveras Creek, Arroyo Hondo, and the ACDD would be similar to that proposed for the CDRP, but water in excess of the existing volumes in the reservoir would be passed through the reservoir and/or down Alameda Creek to other storage facilities rather than being stored in Calaveras Reservoir.

Additional storage would be provided in San Antonio Reservoir and in the Sunol Quarry pits. To accommodate the additional water, Turner Dam would be raised approximately 32 feet to capture an additional volume of about 34,500 AF, and the quarry pits would be lined to prevent seepage losses. A larger pipeline would be needed to convey more water to the San Antonio Reservoir than is now transferred from the Calaveras Reservoir. New pipelines and pumping facilities would be needed to convey water to the quarry pits and from there to the SVWTP. This alternative would reduce impacts on biological resources identified for the proposed project. However, construction of the new pipelines and pumping facilities and raising Turner Dam would result in impacts on biological resources in different locations from those identified for the proposed project, requiring biological mitigation measures similar to those identified for the proposed project. Visual impacts would be reduced but not eliminated, and would be similar to those described for the No Project Alternative.

Feasibility studies indicate that Turner Dam could be raised (Kennedy Jenks Engineers 1986, Vol. 2, p. 8). However, only about 14,000 AF of storage is currently available in the quarry pits. The next increment of storage would not be available for about 30 years, by approximately 2037.

Reasons for Rejecting the Alternative

This alternative would meet the objective of improving seismic reliability. The alternative would not satisfy the objective of re-creating a deeper pool in Calaveras Reservoir to limit algal growth and maintain high water quality. The desired storage capacity could not be achieved in the near term, thus failing to satisfy the primary objective of restoring the water supply and the ability to provide water during the 8.5-year design drought. This alternative was rejected because it does not meet the CEQA requirement that an alternative meet most of the project objectives.

7.10.2 LARGER DAM AND RESERVOIR ALTERNATIVE

The SFPUC considered an alternative to replace Calaveras Dam with a larger dam that would increase the maximum storage capacity of Calaveras Reservoir above the 96,850 AF proposed for the project. Options considered include storage capacities of up to 420,000 AF (URS 2005b). A larger reservoir would meet the supply, reliability, and seismic safety objectives of the CDRP. Construction and operation of a larger dam and reservoir would have greater environmental impacts than the proposed project. Construction activities would take longer under this alternative than under the proposed project. Larger areas of wetland and other important habitat would be lost or affected, and more individuals of the special-status species in the vicinity would be affected during construction and as a result of inundation with the larger reservoir, all requiring greater mitigation efforts. More materials would be excavated and imported to construct the larger dam, resulting in greater visual and air quality impacts and potentially more impact on archaeological resources. The significant unavoidable nighttime noise impacts identified for the proposed project would occur for a longer time under this alternative than under the proposed project. This alternative was, therefore, rejected because it would not satisfy the basic CEQA requirement that an alternative avoid or substantially lessen significant impacts of the proposed project.

This alternative would have more extensive permitting requirements and would be substantially more costly than the proposed project.

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Chris Kern
San Francisco Planning Department
Major Environmental Analysis Division
1650 Mission Street, Suite 400
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